acknowledgements

I would like to acknowledge the contribution of various individuals and institutions in bringing this book to you.

The concept of using built environment as learning aid (bâlâ) emerged during 1996-98 when Vinyās, an architectural research and design group, was working in 60 rural schools under the Lok Jumbish educational programme in Rajasthan, India. It gave us, at Vinyās, tremendous confidence about the feasibility of bâlâ. Subsequently, Vinyās envisaged an inter-disciplinary research project in 2000, supported by Unicef India. Most of the design ideas in this book were developed as part of this work. While Keerti Jayaram, an education and child development professional, designed the educational component, Preeti Vajpeyi and I (co-founders of Vinyās) designed the architectural component. Child development professional Vini Chandra and architect Dhruv Kulshrestha were the other key members of the bâlâ core design ideas development team (referred to in this book as bâlâ team).

This book is a snapshot view of the design ideas portfolio that covers nearly 150 ideas developed by the bâlâ team. The text and poems accompanying some of the ideas, were jointly conceived and written by the core team. Teacher and theatre professional Molyshree Hashmi, the Department of Child Development, Lady Irwin College; the Department of Elementary Education, Lady Shriram College (both under Delhi University); and Samvay, an NGO, undertook exploratory studies on children's aspirations, child behaviour, child development, teaching-learning processes and children's (home) background, respectively. Teacher and environmentalist Ajay Mahajan helped us develop studies on design development for enhancement of the natural environment. Late Jimy Jolly contributed ideas on developing playgrounds using tyres.

The inter-disciplinary resource group for identifying spaces and throwing up design ideas consisted of Asmita Verma, school teacher; Amitabha Mukherji, professor of physics; Anupam Mishra, noted environmentalist; Arvind Gupta, toy designer; Bandana Sen, then a librarian; Jaya Iyer, theatre and education expert; Mukul Priyadarshini, lecturer of elementary education and linguist; Mukut Lochan Kalita and Subir Shukla, both curriculum developers; Sharon Lowen, Odissi dancer and teacher; Shobhita Punja, art historian; Sunita, school teacher; Suresh Vaidya Rajan, architect; Vijaya Shankar Varma, professor of physics.

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The combined efforts of Vinyās, UNICEF India, Rajiv Gandhi Foundation in Delhi, and Department of Elementary Education and Literacy and Technical Support Group of the Education Consultants India Limited (Ed.CIL) – both under the Ministry of Human Resource Development (MHRD), Government of India, has resulted in the widespread dissemination and acceptance of bâlâ ideas across India. There was a long-felt need for such a document in India.

I gratefully acknowledge the financial support of the World Bank through Education Group Human Development Network (HDNED) and Human Development Unit South Asia Region (SASHD) in bringing this work to fruition. The World Bank saw the potential of sharing these ideas not just within India but also with several other countries. Michelle Riboud, Education Sector Manager South Asia Human Development Department, Kin Bing Wu, Lead Education Specialist, South Asia Human Development Department, evinced keen interest in the project along with Robert Prouty, Lead Education Specialist, Human Development Network (all based in the World Bank headquarters) who gave detailed inputs in conceptualising and supporting the publication of the document. Venita Kaul, Senior Education Specialist, SASHD gave useful inputs in improving the content. Renu Gupta, Program Assistant Education Sector provided logistical support.

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Alok Hari, Ramkishan, Pradeep Yadav, Govind Ram, Rajneesh Kumar Singh of NIJH Graphics and Animations prepared illustrations meticulously of spaces and children. Ramesh Chandra helped in organising information presented in the annexure of the book. The English text was painstakingly edited by Bhavana Pankaj. Shagun Agarwal affectionately translated this book into Hindi. Anupam Mishra gave useful insights in the Hindi text. The book has been fondly designed by Vinay Jain.

My wife Preeti Vajpeyi and father Ashok Vajpeyi gave insights at critical stages of development of this book.

I would like to thank all of them for their timely support and help.

KABIR VAJPEYI, 23rd June 2005, New Delhi

credits

This book is available in English and Hindi

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preface

Our times at the beginning of a new millennium are full of exciting possibilities and new challenges. In all parts of the world there are persons, institutions and initiatives that attempt to infuse new meaning and significance into the realm of human imagination and effort. They constitute a global sharing of new ideas, strategies and methodologies, designs and perceptions. The World Bank has been trying to highlight, facilitate and disseminate these by providing them support, public exposure and interactive space.

Building as learning aid (bâlâ) is such an innovative attempt currently taking shape in India which attracted wide attention. Schools are a crucial element in human growth, community living and participation, knowledge-learning and in creating future citizens of the world. They shape human persons at a delicate stage of growth and personality formation and therefore they deserve sensitive care, careful nurturing and imaginative handling. Physical environment of a school plays a large role in determining the quality of learning and teaching taking place there, in kindling curiosity and imagination of children in teaching them how to live and interact together. Somehow, buildings of schools have not been given the importance and attention they deserve. It is in this context that bâlâ is an important initiative. It focuses on the needs of children, teachers and the community with in a school and suggests a large number of design-ideas and ways in which the buildings of schools, their physical environment could not only become more congenial, sensitive and helpful but also contribute meaningfully towards learning and pedagogy. For instance the school buildings, as designed at present, often ignore the perspective of children. On the other hand, bâlâ, somewhat playfully, asks questions which yield such a perspective and proceed to incorporate the answers in the design-ideas it develops. Many of these ideas and ways are being successfully tried out in India and are on way to receive substantial support and expansion from governmental and other agencies there. This book would provide such persons and agencies including education administrators with a manual for work and imagination as also a continuing opportunity to share, pool and further new discoveries.

We also hope that the ideas and ways of improvement in physical environment of schools, as embodied in bâlâ, could also be profitably adapted in many other parts of the world. In a global world, not only goods and services but ideas also must travel freely. The book makes some simple, bold and eminently workable ideas travel globally, as it were.

what is building as learning aid?

This section introduces the concept and purpose of this book.

Background

School is not merely a structure, or a building. Neither is it only an assembly of children and teachers. It is a specialised, indeed, a very special, place for children to learn and grow. It is a place that shapes their thoughts, one where they can see knowledge come alive. It makes them wonder and be creative. It propels them to raise questions and explore answers, identify problems and attempt solutions. School enables children to interact with their environment, and give direction to their future.

Clearly, the responsibility on school is enormous. That is why it is important that school has an environment where teaching and learning are not reduced to a ritual but become a joyous experience, for both teachers and children. The physical built environment, which includes not only the building and its interior spaces, but also the exterior spaces and landscape, could play a crucial role in making that experience more meaningful.

Since the building is one of the most expensive physical assets that a school may have, it is important to design it carefully and sensitively. Apart from providing a comfortable shelter, it must offer an additional 'learning value' to its inhabitants. This is possible if we understand how the use of space and its constituent elements, including lighting and ventilation, can support diverse learning activities apart from conventional teaching. It is important to pay attention to the interface between the design of the building and the teaching-learning programme.

Building as Learning Aid (bâlâ)

Building as learning aid is an innovative way of looking at the relationship of a child with the school space. Bâlâ, we thought, was a fitting acronym because *bāl* in Hindi means child. More specifically *bâlâ* means girl.

The fact that physical space can be a resource in teaching-learning process has never been explored seriously. Bâlâ is about maximising the learning value of school space. A range of learning situations and materials can be actively used as learning resource by innovatively treating school spaces (classroom, circulation spaces, outdoors, natural environment) and their constituent built elements (floors, walls, ceilings, doors, windows, furniture, open ground). This resource can complement the teaching process and supplement textbook information. A three-dimensional space can offer a unique setting for a child to learn because it can introduce a multiple sensory experience into the otherwise black and white world of textbooks and blackboards. It can make abstract concepts more real for the child. Dimensions, textures, shapes, angles, and movement can be used to communicate some basic concepts of language, science, mathematics and environment, and to make learning a truly memorable experience for children.

Bâlâ aims at using floors, walls, pillars, staircases, windows, doors, ceilings, fans, trees, flowers, and even rainwater, as learning aids. For example, a window grill can help children practice pre-writing skills or understand fractions. Angles can be marked under a door shutter on the floor and ceiling fans can be painted with colour wheels for children to enjoy ever-changing formations. Moving shadows of a flag-pole can be used as sundial to understand ways of measuring time; and planting trees that shed their leaves in winter and are green in summer can create a cool, comfortable outdoor learning space.

But, why bâlâ ?

- Bâlâ can be introduced even in the building components of an existing school.
- It can be combined with building repairs, upgradation and new construction.
- It makes joyous learning possible for children.
- It makes a variety of learning materials accessible to children outside the classroom, even after school hours.
- It has the potential to create conducive self-learning situations for children.
- Bâlâ learning aids are not standard. Teachers can adapt them to suit their specific needs and conditions.
- The learning materials, integrated in the built environment, are more lasting and durable, and cannot be stolen or misplaced.
- Even though fixed, these learning aids can be used in multiple ways.
- The value of the school building increases manifold at a fractional increase in its actual cost.

About this book

This book attempts to inspire you – the readers - with ideas that can be integrated into the physical spaces of a child so that the entire built environment becomes a learning aid. Simplicity and sensitivity to the child and the teacher, playfulness and cost effectiveness characterise these ideas.

Bālā design ideas can transform even the existing schools with the help of imaginative teachers and architects, supportive engineers and administration. This is possible with interventions in the **physical**, **cognitive**, **institutional** and **social** domains of an educational system, preferably, simultaneously. This book focuses on the physical domain, with the assumption that the readers and stakeholders will also understand its implications in the other domains and take coordinated action suitable in their own context.

The conception of a school in any village, neighbourhood, town, or a city involves several people. The government sanctions the school. The community acquires land for it. An architect designs the building. A team of construction workers constructs. Engineers supervise and the education department monitors the works. Professional trainers train teachers, curriculum developers design and publish textbooks and teachers undertake actual classroom activity, and so on.

Very often, these different systems and people work in isolation. As a result, children are denied the holistic experience of learning so crucial for them. This book hopes to help these different stakeholders to look at the concept of school from a holistic point of view.

Purpose and use of this book

This book believes children and teachers to be central while planning and implementing education programmes at the elementary school level. Individuals and institutions working in the area of elementary education can use the ideas in this book and even innovate on them. These can be:

- School teachers, parents and management committees of individual schools

- Architects and engineers (in school design and construction)
- Education coordinators at the district, block or cluster level
- Planners and administrators at the state or district level
- Policy makers at the national or state level

Depending on their area of work, they can plan, develop and use the physical environment of school as learning resource.

For example, the policy maker at the national or state level may envisage visible, tangible changes in the physical environment of schools. This book will aid in making a suitable policy and defining the essential components of school environment. It will help an education administrator at the state or district level in planning and implementing ideas in institutional, social, physical, and cognitive domains of the school system. An architect or engineer may use it while visualising more meaningful school spaces and working in close coordination with the learning aspects. Parents and school management committees (like village education committees [VECs] or parent teachers' associations [PTAs]) will find a host of ideas in this book that they may like to execute in their own schools. For a teacher, the book can open up a range of possibilities to creatively use available space as learning resource.

The book contains an inventory of ideas. It also dwells on the possible methods to plan and implement, along with a list of government schemes at the national and state level in India, that can be used for making various components of bâlâ. It also contains contact information about resource institutions for technical and other support.

2 evolution and development of design ideas for school

This section explores the underlying pedagogy – or ways of learning and teaching, the process of development of design ideas and their interrelatedness.

What is a design idea?

This book has a representative inventory of designed teaching-learning aids, which can be incorporated in the built environment of an elementary school. These have been termed as design ideas. When included in buildings, these ideas are expected to help children experience the joy of learning and understand concepts that they encounter in their schoolbooks and also in life.

How were the design ideas developed?

An in-depth understanding of the following led to the origin and development of the design ideas:

- Natural behaviour patterns of children in the built environment.
- Aspirations of children about the place they want to learn in.
- The need for facilitating all-round growth and development of each child as well as the specific needs of children at different developmental stages.
- Issues of inclusive education for differently able children.
- Problem areas in teaching and learning as identified by teachers.
- Issues of repair, environment enhancement and construction of the school building components.
- Children's socio-economic-cultural-educational background at home.

Many ideas came from sheer inspiration and creativity of the various individuals working on the project.

The underlying concerns

Design idea as an organic part of the built environment
Any interior or exterior space or its elements provided, made or nurtured by human beings for the school constitute its built environment. The interiors include walls, floors, fans and furniture etc. The exterior settings comprise trees, landscape and the boundary wall etc. A design idea must be an organic part of this built environment. In other words, it must primarily perform the function it has been made for. For example, a window has to function as a window first. Subsequently, it can double up as a learning aid as well. Care has been taken to do this lest the design idea should become a three-dimensional model, which has to be provided separately, but has no other intrinsic use or value.

Uniqueness of three-dimensional space
Design ideas explore and utilise that uniqueness of three-dimensional space, which may not be possible in any other form of learning. While looking at a map from a book may give the child an abstract image of a geographical area, reading a map in three-dimensional space will generate concrete experiences such as dealing with the scaling of distance, identifying landmarks, understanding spatial relationships between objects and so on. Or, in the case of measurements, concrete understanding of real distances, real lengths/widths/heights, real volumes and weights has been attempted by relating and reinforcing the concepts with real-life situations such as the length of a corridor, the width of a window, the volume of a water tank in relation to one glass of water, or the weight of a piece of classroom furniture.

The unchanging nature of a building
One of the most common issues regarding the use of a building as a teaching / learning aid is that a built structure is 'permanent'. So, wouldn't the aids in the building environment become unchangeable and, therefore, less adaptable too? Well, while the built element may be permanent, the range of learning experiences that can be generated through it defies the rule of permanence. Different children may use them in different ways at different times. Also, each grade will have a new set of children every year. The proposed design idea of a Grid Board is an example. While the grid, by itself, is a permanent fixture on a wall, floor or glass pane, a wide range of activities can be generated around it for different subjects like maths, language and science as well as for different classes. Thus, a permanent-looking feature allows multiple uses. The essential precondition is that the grid must be placed in a way that allows it to be accessed at different times by users of different ages and grades. Different children may also have a different pace of learning. A learning aid in the built environment remains accessible to a child even after class and she/he can interact with it at her/his own will and pace.

Concrete experiences in the built environment

As against reading from books where many notions remain abstract and even dissociated from life, buildings have a unique potential to offer experience-based learning. The design ideas don't undermine the importance of books and blackboards. Instead, they explore ways to complement the limitations of the latter with real-life experiences available in three-dimensional space. Ways in which various aspects of mathematics – number sense, angles, measurements and fractions – have been dealt with proves the point.

A classroom map on the teacher's table

Addressing the core learning areas

The design ideas address the learning areas identified by practising teachers and experts actively engaged in education. Care has been taken not to be very specific to a particular curriculum, which, in any case, varies as per place and time. The effort has been to identify and address problem areas of learning which cut across different curricula.

The role of a teacher

The design ideas here are based on the tacit assumption of child-friendly and interactive pedagogy. The effort here is neither to replace the teacher nor the existing curriculum. In fact, the true potential and value of the design ideas cannot be achieved without the active involvement of the teacher. Even though children can use several design ideas on their own, the role of a teacher as facilitator is key. The latter must be aware and sensitive to give the child the freedom she/he may need to play with these ideas. In the case of classrooms, the design ideas have been spread across the classroom space. The teacher can move around in the classroom and interact with the children as they use the ideas on their own. This will shift the classroom focus to the child and forge a more intimate relationship between the teacher and the taught.

Creating a conducive literacy environment

A study conducted on a small sample indicated that children in the municipal schools of Delhi come from homes with a rich oral tradition but have limited exposure to print. Thus, the opportunity for them to be actively engaged with the written word at home is also limited. The complex processes of reading, writing and constructing meaning can be fostered in schools only when the environment allows for mistakes and encourages children to read and write freely and share their experiences or fantasies in meaningful ways. That is the only way they can connect the written word with their lives. A look at most schools reveals limited opportunities for such spontaneity. Most reading and writing happens within a pre-determined curriculum, often disconnected from the child's world. Design ideas in this book provide for several writing and display surfaces, and labelling of objects and spaces. There are Book Corners, Word Walls, Activity Boards, Grid and Dot Pattern Boards for word-games. There are visuals to stimulate language and many other ideas that focus on creating a favourable literacy environment. Consistency in script, its colour and treatment is recommended wherever labelling and signage or text related to mapping occurs. The reason is that familiarity facilitates reading for young children.

Addressing multi-grade situations

Multi-grade teaching in schools is a reality in countries like India and it may continue for some time. Handling students of many classes together by a single teacher not only requires the latter to be specifically trained but also the space to be specifically shaped. Bâlâ allows self-learning activity to be spread across the school space. The teacher can move from one pocket to the other after initiating an activity with one grade. To this extent, bâlâ supports the multi-grade system since it allows different learner groups to learn in the same space or interconnected spaces. However, the designer must be aware of multi-grade teaching in school to be able to make suitable modifications in the existing or new design of the building. The learning pockets must be visually connected so that the teacher can monitor them for reasons of security and supervision.

Learning with fun

At the outset, this work attempts to help the teacher and the students to explore new dimensions of exciting and joyful learning. Children are great inventors and discoverers of space. We have endeavoured to weave the design ideas around such spaces. In other words, the design ideas are located in different spaces in such a way that children interact with them naturally. The ideas do not invade the private world of the children but are sensitive to it, and nurture it more creatively. In fact, there are several design ideas that are intended for fun. Children can climb, jump, swing, and use the Pipe Phone, Mystery Walls and so on, without feeling obliged to learn in the process. It is a different matter that some learning may still happen!

Horizontal elaboration of concepts : one idea, many approaches

A concept can be reinforced in a child's mind using more than one way. For example, the concept of time can be understood through different design ideas like the Sundial, Hourglass, Calendar and Clock. This is because different children learn the same thing through different modes, and at a different pace. Also, they may be at different levels of learning within a school or a class. This is termed as 'horizontal elaboration' of an idea. The attempt is to provide as many learning aids as possible to children so that they understand the same concept through various experiences in a more effective and lasting manner.

Design ideas offer a choice of variations

Each school, its situation and context are different. Hence, there are several variations within each design idea. For example, a school that intends to make window security grills may opt for Fractions on Window Grills. Another school planning to repair and re-lay the floor may opt for Fractions on Floor tiles. Thus, while the grouping of ideas may show several ideas in one space (see chapter 4), a school can choose the ones suitable for it.

Designing for accessibility to children

The more a design idea is accessible to children, the more they are likely to use it. So, it must be located in a setting based on the natural behaviour and preferences of children as well as the characteristics of the space. This means that the characteristics of a window, where a child stands or looks out, will be different from those of the floor. Secondly, the idea should be positioned in a way that children can easily approach and interact with it physically and visually. The height, width and spacing of a design idea should be age-appropriate. The bâlâ design team has worked out comprehensive anthropometric data for the purpose.

Since the designs envisage multiple sensory perceptions for children and allow for horizontal elaboration of a concept, chances are that differently able children will benefit immensely from them. However, this will depend upon the nature of their challenge and the likely interaction they will have with the building element. The designers firmly believe in inclusive education. Hence, the book makes no provisions for segregation and attempts subtle ways of inclusion.

Diversity of cultures

It is also important to address the diversity in backgrounds of the children and their communities. They bring to the classroom this diversity and many different ways of learning to which the built environment must be sensitive. Board Games, for example, are an inherent part of our culture and are good for problem-solving exercises. There are ways, other than the metric system, to measure length, which many of us still use. These have been integrated in the design ideas. Dot Patterns, to understand two-dimensional shapes, use a variety of forms and images from our culture. Cultural motifs, images and visuals have been used throughout. This is to introduce children to a rich diversity that folk, tribal and classical traditions offer – something virtually ignored in contemporary school environments. A school is, however, free to make an independent choice as long as it addresses the above concerns.

Sensitising the school to girls

Unfortunately, there are places still where girls are kept away from a variety of learning situations beyond their school for reasons of security and work at home. In fact, for most of them school ends with primary or elementary classes. It is, therefore, the added responsibility of a school to provide maximum opportunities for learning for the girl child while she is there. While design ideas in this book address this concern, the school can innovate and use them for girls to simulate real-life experiences.

The built environment cannot achieve it all

Design ideas presented here do not attempt to overstretch the concept or offer impracticable solutions in three-dimensional space. They have been developed and included here only if there have been visible shortcomings in the traditional modes of learning that the former can complement or, if necessary, replace.

Cost-effectiveness and better use of existing resource

The design ideas should be cost-effective. This implies that their execution be simple and labour-intensive. They should be eco-friendly, utilise local materials and skills; are durable, low in life-cycle costs and can be maintained by the school. Many design ideas use junk and waste material like discarded tyres to create rides and play equipment etc. The very process of planning and integrating them with the other works of the school will halve the cost that one would incur if they were made separately as stand-alone items. For example, a Board Came can be integrated with the floor while it is being laid or repaired. But the cost will be twice as much if the game is added to an otherwise good floor.

Integration of design ideas with repair and new construction

It is interesting to note that the wall surface up to about 1.5 meters from the floor needs maximum repairs in many primary school buildings m India. This is also the level that is the most accessible for children in elementary school. Many design ideas like Activity Boards, Dot Boards, Grid Boards, Writing and Display Surfaces are meant to be located in this 'repair' zone. The flip side, however,

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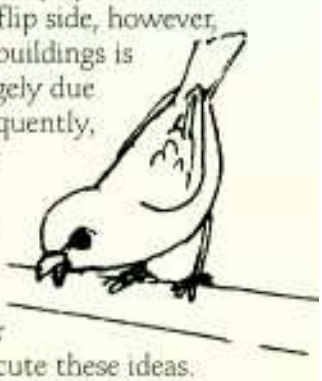


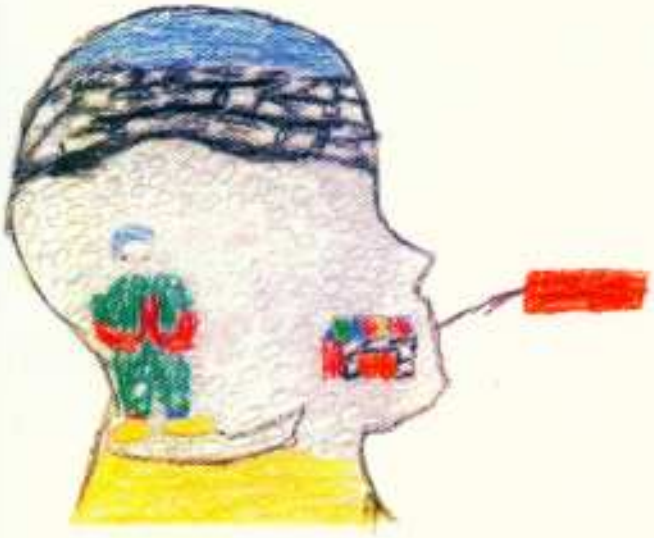
The next section elaborates on several bâlâ design ideas.

3 design ideas for built elements in schools

This section presents a smattering of design ideas to demonstrate as to how they address the child and the teacher and also how the built environment can be used in a holistic manner.

Children's aspirations from school spaces

Isn't it strange that we plan and make schools for children without ever taking their opinion or aspirations into account? We continue to perceive their requirements from our own adult perspective. It is important to know what children, as the end-users of a school building, want in their learning environment. All that needs to be done is to make them aware of their school spaces along with their physical attributes. Soon, they will communicate their feelings verbally, visually or through the written word. A study was undertaken to elicit these feelings. Some representative ideas of what children want from their school spaces, are presented on the facing page :



NARESH KUMAR studies in a school that becomes very hot in the summer due to asbestos sheet roofing. He drew the profile of his head and depicted himself in it as surrounded by snow and ice. He said he wanted a school cold like ice so that he could study comfortably even when there was no electricity.

MANOJ drew a park, which was open, had swings and toys to play. He said he liked to be in a green space with cool breeze.

MANAKI's dream school had a hill, waterfall, park and lots of trees. The sky was visible so that she could see the birds, the sun and all the colours.

Several ideas came from such simple and innocent aspirations. Interestingly, not even one child mentioned the school building. The following design examples can address some of these aspirations:

Natural shade for buildings

Naturally shaded buildings not only look and stay cool in summer but also do their bit for the environment. Winter deciduous trees, with a large canopy and foliage on sun-facing sides (especially, southeast, south, southwest and west for regions in the northern hemisphere), can be planted in a way that they keep roofs and walls shaded. In addition, roofs can be painted white to reflect the direct ambient sunlight. Naresh's aspiration to keep his school cool can thus be addressed.

BEFORE
AFTER

Trees work best when there is sufficient open space around the building to grow them. Some trees suited for this purpose are:

- Bahera *(Terminalia bellerica)*
- Champa *(Plumeria species)*
- Gulmohar *(Delonix regia)*
- Imli *(Tamarindus indica)*
- Kachnar *(Miragyna parviflora/Bauhinia variegata)*
- Kusum *(Scleichera oleosa)*
- Palash/Tesu *(Butea monosperma)*
- Persian Lilac/Bakain *(Melia azedarach)*

Vines that stay green in summer can be planted so that they climb walls, cover roof and cut off direct sunlight on it. Climbers and creepers are also suitable where there is little space around the building. Names of some vines are:

- Madhavi *(Hiptage beghalensis)*
- Bougainvillea *(Bougainvillea spectibilis)*
- Curtain creeper *(Vernonia species)*
- Railway creeper *(Ipomea palmata)*

These species are hardy, easy to grow and require little maintenance. They do not require much water to grow. Schools can contact horticulture or social forestry departments to provide assistance in identifying and supplying such locally available plants.

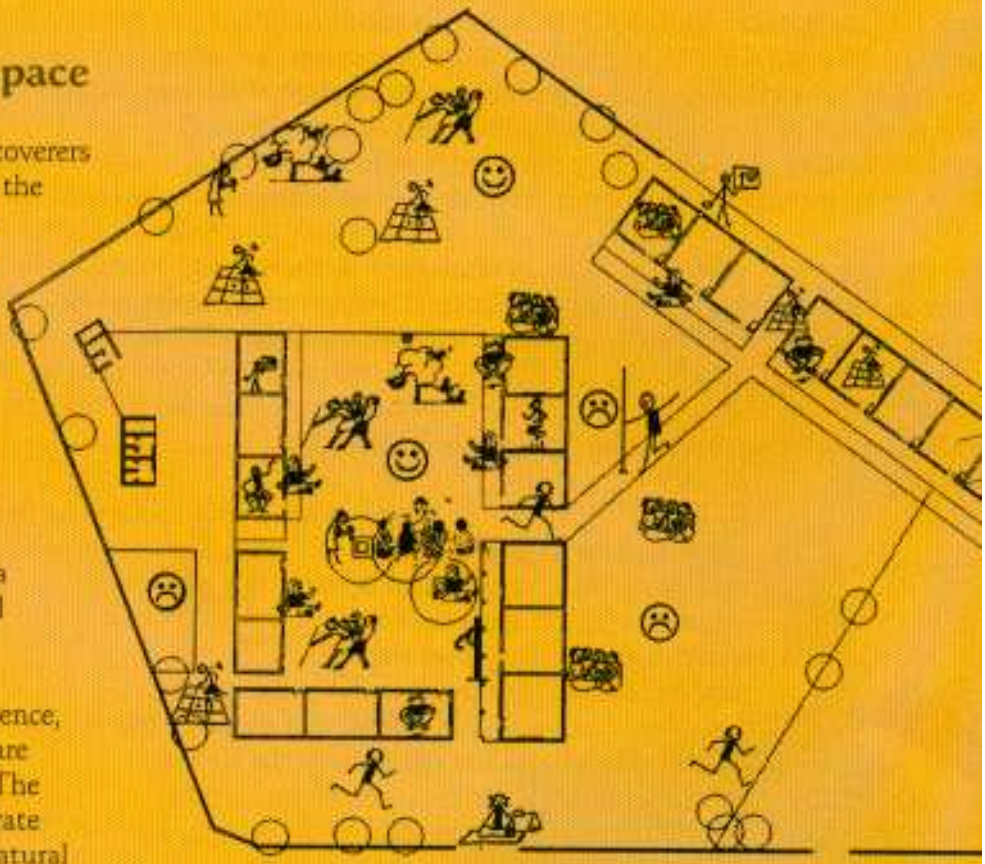
Tyre Flipper

A school without swings and games doesn't sound like much fun, does it? But it is not easy for education departments and schools to get good sturdy play equipment that can be maintained in remote locations. Simple swings for Manoj's school can be made using discarded tyres.

The Tyre Flipper that you see in the illustration uses a large truck tyre that still has some treads to provide stiffness to it. Round bars of 40mm diameter are used to pivot it. The maximum height of top 50mm handle bar is about 75 to 105 cm from the ground. The pivot for the tyre flipper is about 45 cm from the ground. The timber posts of 15cm diameter are fixed firmly at a depth of about 60 cm.

Natural behaviour of children in school space

Children are great inventors and discoverers of spaces. What do children do with the spaces that they have or discover in school? Well, they run, play, jump, talk among themselves, hide and do a score of other things that can be termed as natural behaviour. But, often school spaces are not sensitive to these behaviours. Careful observation and understanding of children's behaviour in school spaces have yielded a number of ideas. But first, a few observed behaviours in an actual school.



Based on the patterns of their occurrence, ideas can be located in pockets that are likely to generate those behaviours. The examples on the next page demonstrate how ideas connect with children's natural behaviour.


Running


Revolving around the pole


Jumping on floor


Playing Stapu


Creative expression


Peeping/ Hide and seek


Collecting natural materials


Scribbling on wall/floor


Sitting alone


Pretend play


Playing Gitte/ marbles/tops


Climbing/jumping/ swinging


Large group games : Kho Kho, Kabaddi etc


Sitting in groups


Structured class


Space preferred and used by children


Space not preferred by children

Revolving around the pole
(and understanding a cyclic phenomenon!)

Children love to go around a round column or pole. This activity can be linked to the cyclic phenomenon around us – phases of the moon or germination of seeds, for example. Planetary motion or lunar cycles represent the concept of spiral time, which is, often, very difficult for little children to picture. But its visual depiction on a continuous, curvilinear surface of a column can make it easier for them to visualise and understand the abstract concept.

Peeping
(and hiding behind a mystery wall!)

The world abounds in little Peeping Toms. Peeping comes naturally to children. So, a mystery wall in the school corridor that offers opportunities of peeping and hiding is just the thing for them. Children, of course, will love to disappear and watch others from behind, or play hide and seek, I-spy and such like games. But it can also be used for storage with shelves of different types, sizes and levels along the corridor for craft and science activities.

Moving furniture
(and finding its weight in the bargain!)

Children enjoy pottering about with furniture in schools. They push it, pull it or even lift heavy articles in their enthusiasm. But they are, often, poor in estimating the weight of these objects. Why not paint the weight of a table on it and other objects that they are likely to move around? This will help them develop a sense of how much is 8 kg or 20 kg.

Addressing child development in school space

It is important to know if the learning environment of a school adequately addresses the physical, social, emotional and intellectual aspects of children's development, depending on their age group. Simple interventions are needed to do so. The precondition is to be aware of these aspects and, then, think of ways to address them.

Physical development of a child

Accessibility of Built Provision and Learning Material

The height, weight and other anthropometric dimensions of children increase with age. Thus, the furniture and various built elements that children interact with in school must be comfortable, accessible and responsive to this change. This is also true for the location of hardware fixtures on doors, windows, wardrobes, rails, shelves and chalkboards etc. Fixtures such as bolts and hinges should be identified for their safety and usability by a child, apart from ensuring absence of sharp edges or splinters on welded parts. They should be designed to send out this message to children, 'I can handle my environment independently.'

Facilitating Physical Activity through Landscaping

Even as accessibility and comfort are important, children must also have a few challenges to help their growth. Spaces and their elements must allow them to run, jump, climb and discover their own ways of exercising their bodies. For instance, the school can plant trees and do some sporty landscaping for children to perform a range of body movements like rolling, sliding, jumping etc.

Social-emotional development of a child

Spaces to be Together

Children don't just learn in a classroom. They learn all the time – at home, in the neighbourhood, and with other children. The latter, as we all know, is called peer learning. It is important that a school has spaces

where children can interact with each other and with differently able, older or younger children. These areas – either in the interior or the exterior spaces of a school – must enable story-telling sessions, play-acting and just regular chitchat. While some should be able to accommodate larger groups, others must be suitable for smaller peer group sizes of three or four. (You can see more such spaces later in this book)

...And Spaces to be Alone

At the same time, children, like adults, also need private moments to reflect, and spaces to be alone. And these are equally important. Small, cosy Book Corners can also be developed. However, care should be taken while designing or modifying spaces that such pockets are not lonely or entirely secluded. They must be within the visual command of the teacher for safety and security, and, perhaps, allow for some winged visitors to quietly interact with the child!

Intellectual development of a child

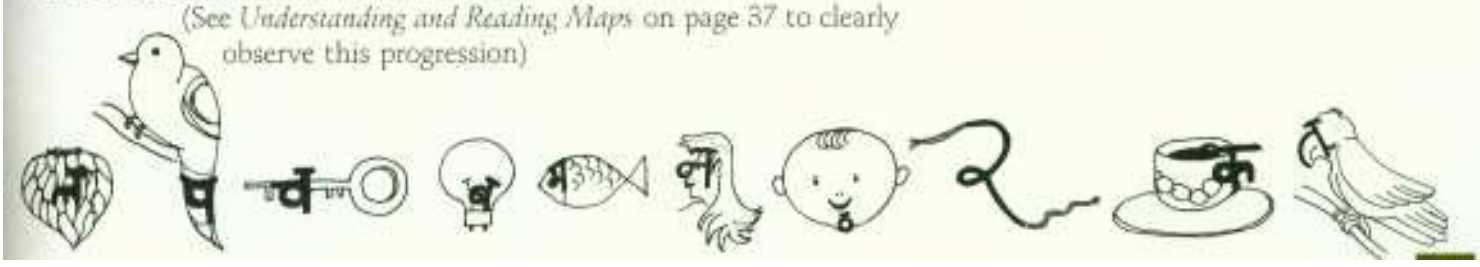
Walls are, perhaps, the first blackboards or notebooks for children, much to the dismay of many parents, teachers and educationists. Well, the good news is that this tendency can be channelised for several structured and unstructured learning activities at designated spots.

Alphabet Shape Boards

Alphabet Shape Board is one such structured activity board for intellectual stimulation. Alphabet shapes can be used to draw pictures of objects beginning with the same sound as the alphabet. This is a fun way of learning alphabets and recognising their shapes. Children can use these alphabet pictures to write words or sentences. This can become an interesting language activity. This is only a special type of chalkboard that has two parts – a border and the writing surface. The border on top of the board has a painted picture guide created from alphabet shapes. Such picture alphabets can be combined to write words or sentences, as shown. Children can draw their own alphabet pictures on the border and have fun using these to create words or write short sentences or messages. Such boards can be up to 150 cm wide. The writing surface can be ruled or plain, as the teacher wants. Drawings on the border must be attractive and easy for child to copy.

In addition to the above, the ideas also address the growth of children in school spaces. For instance, children grow from 5 or 6 years to about 14 years in elementary school. The change, during this time, isn't just physical. It also occurs in the social, emotional and intellectual domains of a child. Issues and their complexity also change with age, which must be addressed. Many design ideas move from simple to complex, familiar to unfamiliar, near to far and concrete to abstract as children move from class 1 to 5.

(See *Understanding and Reading Maps* on page 37 to clearly observe this progression)



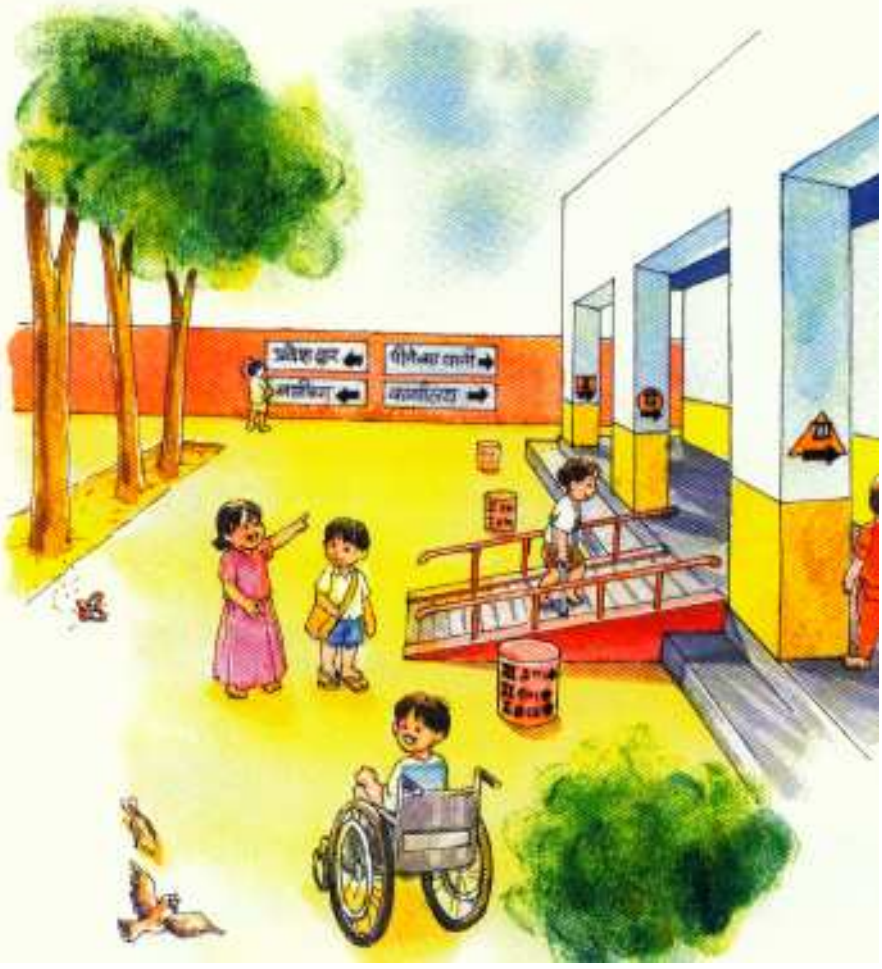
Learning environment to include differently able children

Inclusive education for differently able children (those who are challenged) is important for social integration. It is desirable for the so-called 'normal' children to learn to respect the differently able children and see them as children first. The built environment should not only be comfortable and accessible for such children but also provide useful learning material to them. Many of the ideas here are based on the 'cue' that our senses perceive – tactile, visual, kinaesthetic and so on. The built environment cannot address all the domains of learning for such children. But it can certainly be made more enabling so as to reduce the 'differences'. The learning provisions should be subtle and unobtrusive so that their intrinsic value is the same for the so-called 'able' and 'differently able' children. Let's look at some such provisions.

Accessibility Ramps

These are useful for the physically challenged children. While a ramp is usually thought of as essential for wheelchair-bound children, many schools may not have an access road for a wheelchair. Hence, the access to school itself must be carefully planned. The community must think and plan this together. Even otherwise, ramps give to children interesting kinaesthetic experience of moving up and down a continuous gentle slope.

The slope and width of the ramp is of particular significance. The slope should not exceed 1:12. (This means for every 1 meter height to be climbed, the length of the ramp should be not less than 12 meters; shorter the length, more the slope). Thus, for a typical 45 cm high plinth on the ground floor, the length of the ramp to climb shall be about 540 cm. This slope is crucial since it allows even a child in a wheelchair to independently reach the plinth and get inside the building. The minimum width of the ramp for this purpose should be 90 cm. The floor of the ramp should be textured to avoid slipping. It should also have a side skirting 10 cm high to prevent crutches or guiding stick to slip away from the ramp. A grab bar or railing at 60 cm height from the adjoining floor for hand support is also a must.



Milestones in Spaces

Comfortably located milestone are like guides for children to know the distance between different spaces from different points located within the premises. These are a must along

circulation pathways and corridors, junctions and ends and help differently able children to plan the shortest path to access a space. Milestones can be placed at regular intervals or defined distances on columns, dustbins and seats etc. so that they are clearly visible and understood. They can be of different colours or shapes with clear text style that is consistent with general labelling and signage.

Labelling and Signage

Similarly, Labelling and Signage also help guide the movement of differently able children. The decision of what to label must be made at the school. Labelling of spaces, objects, built or natural elements indoors and outdoors is an effective way of helping children actively engage with and relate to their environment through printed word. In other words, it becomes an effective way of enhancing the literacy environment of the school. The words chosen can become more complex in higher classes. The greater the extent of Labelling and Signage, the more the children are likely to learn to read and use these and other visible written words in their surroundings. Using a uniform and simple script or font for the entire Labelling and Signage facilitates reading. Signage may be used to indicate various indoor and outdoor spaces, like classrooms, library the principal's office, playground and toilets etc. This also facilitates mapping exercises. Signage can be an interesting component of language exercises in giving directions and following clues etc.

Pipe Phone in Grab Bar

A grab bar on the ramp or in a corridor is a useful provision for differently able children. While, it supports and guides their movement, the grab bar can be tweaked to become a Pipe Phone. The suggested grab-bar height of 60 cm for support is also workable for the Pipe Phone. The pipe should be of at least 5 cm diameter, while the length can vary to suit its basic function. Both the ends should be left hollow and all obstructions in the length of the pipe should be eliminated. The edges should be rounded and smooth so as to prevent injuries to the child. Apart from two children at the two ends of the pipe, small offshoots from the main pipe can enable other children to also join the fun. Please ensure that these offshoots are so placed that they do not hurt the children if they lean against the railing.

Grooved Writing Patterns on Walls

Very often, a school may not be equipped to offer appropriate learning materials for children with special needs. Learning materials in a tactile medium are useful for all children, particularly for the visually, hearing or speech impaired. Grooved Writing Patterns on Walls can help all the children to trace and strengthen their finger muscles. Outlines of alphabet patterns can be made like grooves over which children can trace with their finger. This will strengthen the movement required for writing an

alphabet shape and enable feeling it (the shape) through finger or wrist movements. Children can be asked to hold a stick or chalk and move it along or within the grooves to help them get a good control over the pencil within a given area.

Interestingly, many traditional cultural motifs may have shapes that offer an excellent resource for practising fine motor movements required for writing alphabets in the Devnagari and Roman scripts. Similar motifs can be found for other scripts as well. Such motifs, with inherent finger movement patterns, can be used to make borders. A few examples of these motifs and patterns are shown here. These motifs provide both visual and tactile stimulation. The latter observation is based on the fact that children like to touch the wall while moving along a corridor. It is also good learning material for the visually challenged children to appreciate beauty through touch. This can be done while plastering / replastering a wall using simple tools.

Learning resource for subjects through built elements

Design ideas can also be used to teach and learn different subjects across different grades. Representative subject areas, that can utilise the unique potential of three-dimensional space to understand a problematic concept, have been enumerated below for the purpose of this book.

Mathematics

Measurement Scales

"How far is your school from home?"
"How heavy is your school bag?"
"How many cups of water does your bottle have?"

Children may give different answers to these questions and yet may not be anywhere close to the correct one. Somewhere, they lack the sense of estimation and measurement. In the built environment around them, they interact with many elements that can help develop this sense in a tangible way. For example, the length, width and height of the classroom, doors and windows can be painted so that children know how much is 2 meters, 3 meters or 6 meters in the real world. Similarly, a unit length of a floor panel can be used to estimate the entire length of the corridor (see the floor in Corridor as Space for Exploration and Discovery on page 63). The volume of a water tank can be painted on it by relating it with child-scaled measure of a glass or bottle (see water tanks in Map of School on page 38). With a Measurement Scale painted in the space around them, they can even measure themselves or objects that they use frequently.

Door Angle Protractor

"Where do we find angles in the real world?
"Do they have something to do beyond math chapters?"

Angles, somehow, have always been confined to math books. But as it happens, they are present in every space that surrounds us - in every room, corridor, and courtyard and, even, in open spaces. All one has to do is to paint them in the locations that children frequently use and interact with. Better still, why not just paint or make them on the floor right under the door shutter of the classroom? It's like an angle protractor. Any door shutter swings a range of angles when it opens. This can be done in a variety of ways – simply paint the angular lines, or make floor panels to mark the angles while repairing or making a new floor.

Fractions Aids

"Fractions in the wall, fractions in the grill
Fractions to look at, fractions to fill
They're hiding on the floor, and in tile patterns too
So many types of fractions, simply waiting for you!"

To many of us, fractions are perplexing things, synonymous with pangs and problems. Teachers devise various ways to make children understand fractions. But it is always helpful if they can see or touch a physical object to understand the concept of 'whole' and its 'parts', or fractions. The built space offers several opportunities for doing this. Whether it is the tiles on a wall or floor, sections of a grill, paved sections of a circle on a ground, fractions can be experienced in several real ways.

The concept can be reinforced in different ways to suit different situations. Fractions can be made on window grills if they have to be either repaired or made anew. Fraction Tiles on Walls and Floors can be made where a new wall or floor is going to come up. As mentioned earlier, different children learn in different ways. It, then, makes sense to have all the three options in a school.

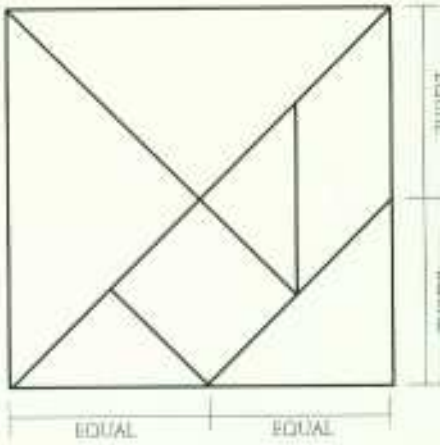
On the wall, the first row from the top has tiles of a specified length (in this case, it is 60 cm). The tiles in the second row are exactly half the length of the tiles in the first row (30 cm). Thus, two tiles in the second row fit into the length of one tile in the first row.

The third row has three tiles fitting into the same length (20 cm), and so on. While six vertical sections are visible above, younger children can be shown the tiles in one vertical section and made to understand and identify the fractions 1/2, 1/3 and 1/6. Older children can look at larger lengths and the greater number of fractions such as 2/3, 2/6 and 4/12 etc. contained in them. They can use this aid to compare different fractions as bigger, smaller and equal and do addition and subtraction of fractions. One section of the fraction wall can be used as an illustration of the Lowest Common Multiple (LCM), when tiles of different sizes start and end at common vertical lines, as is evident above.

Tangram Tiles

"All we need is a square
Cut in seven parts, with some care
Apply your mind and make wonderful shapes
Lo and behold...
See the magic, as it unfolds
This is the age-old game of Tangram"

Tangram Tiles are based on the geometric puzzle of seven pieces, the Tangram. Tangram is a thousand-year-old Chinese puzzle. A square is cut into seven geometric shapes, which can be arranged in thousands of ways to create human figures, animals, geometrical shapes, alphabets and so on. The essential condition in a Tangram puzzle is that all the seven pieces must be used to make a shape. There are geometrical shapes in the objects and people that surround us. And teachers know it too. This knowing can make geometry a lot of fun. But very often, preoccupation with syllabus spells an end to fun. A Tangram immediately frees geometrical shapes and their property to combine with others from the confines of a book into a world of visual enrichment and creativity. After understanding the underlying principal of a Tangram puzzle to make any object, children can evolve their own shapes and forms.



Tangram Tiles on Floors and Walls are an innovative use of waste square tiles to create visual stimulus. Tangram Tiles allow puzzles to reveal themselves readily to children and teachers in the physical space that surrounds them. Very often waste or leftover ceramic tiles in various colours and sizes are available with tile dealers at highly discounted prices. Such square tiles can be bought, sorted and cut into Tangram shapes. Such tiles can be used while repairing or making a floor or a wall. Using a tracing tile (see page 54 for details on tracing tiles under Tracing and Rubbing Surfaces) with Tangram shapes etched on it, children can make their own pieces of puzzle with waste chart paper.

Sciences

Understanding the notion of time

Time is a difficult concept to understand, more so for young children. It is important to put this abstraction in their context by exposing them to several ways of understanding and measuring time. This is so because different children may need different perspectives to comprehend time and ways to measure it.

The built environment can use different media for measuring time – ranging from the movement of shadows in a sundial to the reusable calendars that children can make themselves. These are simple, non-electrical devices that can be made with rudimentary materials in schools. Incorporating these in the building gives children real experiences and opportunities to actively link time to their daily life experiences. This is not possible through textbook representations. Children can use these time devices in play or through a variety of enjoyable activities.

Sundial in Open Space

"What is the time?"
"Who ran the fastest?"
"How long did it take?"
"Why did the shadow of the wall move through the day?"

Sundials are an interesting way to visually perceive passage of time with the movement of shadows on the ground, wall or ceiling. Sun occupies a unique position in the sky every day, every hour, within a year. If a pole is placed on a ground at a preset location, its shadow will also be guided by this unique position of the sun every day. This relationship of the sun and the movement in the shadow of a pole makes the sundial possible. Every year, a unique position is repeated. Thus, a sundial is cyclical and can be used as a clock for one whole year. A variety of sundials can be made on the ground, walls and ceiling etc. A vertically erect pole on the ground will take a larger dial size to accommodate longer shadows. A cylindrical dial will be smaller but should be located so that children can still revolve around the pole.

Planetary Orbits on Ground

Twinkle, twinkle little star
How I wonder what you are!
"What are these twinkling stars?
What are planets?
Do they move? How?
Why does winter change into summer?"

These are fascinating questions for every young child, but not so easy to answer. This idea captures the fact that children enjoy revolving around poles or anything that allows circular motion. In using this, children can act as planets and move along the orbits, which this design idea allows. Since this idea uses the natural inclination of children to move around circular objects, the space around a flagpole or pillar is a suitable location. They can experience the two movements – rotation and revolution – of the planets through the actual movements of their own bodies. The difference, however, is that the shape of the orbits will be circular, and not elliptical, as in the case of actual planets. But this can become an experiential base for children to relate to while studying more advanced ideas of planetary movements in their textbooks. The nine orbits can be divided into four quadrants to represent the four seasons. Each of these quadrants uses different ground surface materials with variation in texture. Each quadrant, as shown, is further divided into three so that there are a total of 12 equal sections. These can represent the 12 months of a rotating earth. So when the earth lies in a particular section, it can signify the month of January and so on. It is the three-dimensional relationship of children (as planets) to the pole (as the sun) that will help them understand various concepts.

Classroom Calendar with Clock

How many days are there in a week?
How many weeks are there in a month?
Days, weeks, months and years
They do confuse us, Oh dear!

Events and experiences for children, as for all of us, vary tremendously in terms of time. Some events happen within a minute or two, others take an hour, while still others take a day, month, year or, even, longer. It is difficult for them to comprehend the passage of time, since it is abstract and so varied. The complexity of large time spans can be made easier to understand by getting children to actively interact with a calendar and relate it to their daily experiences. This can be enhanced through time-related visuals, depicting seasons, social and other events.

Wall calendars have a permanent reusable wall surface made for this purpose. Children can actually create their own calendar in the frame

provided. They can colour it or write on it to understand the system of a calendar. The square calendar shown here depicts three months along with a clock. A border around the calendar can provide time-related visuals to reinforce children's understanding. The clock, with moveable hour and minute hands, can be put next to the calendar. The physical accessibility of the calendars increases possibilities for children to interact with them in interesting ways.

Understanding and reading maps

Where is your classroom?
In my school.
Where is your school?
In my neighbourhood.
Where is your neighbourhood?
In my city.
Where is your city?
In my country.
Where is your country?
In the big, wide world!

'How can I possibly fit the drawing of my big school into such a small page of my notebook?' This is the dilemma of many children. The skills for mapping and map reading have to be taught to them through carefully planned activities. The three-dimensional built space around us offers unique possibilities to develop these skills. Mapping is all about trying to represent a three-dimensional world in a confined, two-dimensional space. This means discovering ways in which large spaces and huge objects can fit into a notebook in exactly the same ways as they are arranged in the real world.

Younger children can begin with mapping their immediate surroundings. This can actually be a tool for them to become aware of distances between objects and how these can be represented in a map. Subsequently, they can learn to map more complex and larger geographical areas, which are not within their direct experience, for example, a village, city or country etc. The objective is to make mapping a tangible, meaningful experience by the time children begin to deal with the maps of India and the world in grade 5. Reading maps, however, can remain a problem even till adulthood. What's true for other concepts is true for mapping. Often schools fail to equip children with map-reading skills because they do not address their age-specific abilities to do so. As mentioned earlier, schools must find ways to address the growing complexity of ideas as children grow up. Across the grades, the following design ideas for mapping have been conceived as growing from:

- Simple to complex
- Familiar to unfamiliar
- Near to far
- Concrete to abstract

Map of the Classroom on the Teacher's Table or Classroom Floor

An outline map of a classroom may be made for children of grades 1 and 2 on a horizontal surface, like the teacher's table or the classroom floor. This will introduce them to a map by linking it to their immediate surroundings (a classroom).

Map of the School on a Centrally-located Courtyard/Platform

A large outdoor floor map of the school allows children of different grades to observe places, objects, routes and trees around them and locate them on the map. This can be made on a horizontal or vertical surface, preferably in a central location from where children are likely to pass every day and see the entire school space. The map should be oriented in the same direction as the school. The teacher can highlight the location of the map in the map itself. Some other reference points and prominent landmarks of the school – the principal's room, stage, drinking water area and so on – can be marked prominently.

It may be noted here that maps of the neighbourhood, or the state will be useful at grade 3 level and may be printed on charts or painted on walls. If the children have gone through the first two levels of maps described, reading these wall maps should not be a problem.

Activity Brick Map of a State/Country

This is a large outline map of a country, lined with bricks and mud / sand filling the inside. It enables learning by doing. Children love to build with mud and sand. By providing an outline map of the country in a mud and sand area, children can playfully explore the features of a map through these materials. They can create their own mountains, valleys and rivers. They can make ships in the ocean and cars or trucks on land. They can move their ships, trains, cars or bicycles on it by making waterways, railways and roads that connect different places or physical features which they can locate in the map. In doing so, they can also get a sense of the direction they are moving in. This activity map can be used by children of all ages and made as in Activity Space to Play with Mud and Sand (see page 67 for more details).

Language

Reading and writing are complex processes with which children engage actively to construct meaning or communicate. That is why they learn to read and write in the first place. Children learn these skills best in a school environment that is non-threatening and addresses the experiences they bring with them. The following design ideas attempt to explore ways of creating a stimulating literacy environment within the built spaces of a school, while keeping the curriculum in mind. These also attempt to address the needs of first generation learners.

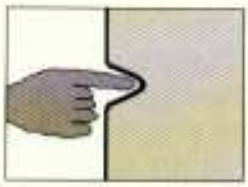
Writing Aid on Window Security Grills

"Ten little fingers want to do well,
How do they gain strength, can you please tell?
Ah, see those alphabet patterns in the window grills,
Move little beads along and build finger movement skills,
Follow alphabet patterns made in lines on the walls,
Prepare little fingers to learn writing,
Even when they are small."

Writing activity requires fine motor coordination of the finger muscles. Children must have strong finger muscles to be able to write. Very young children initially use the shoulder for scribbling and drawing. As they grow older, this movement shifts to the elbow, then to the wrist and, finally, to the fingers. To develop finely controlled writing movements, children must learn to freely move their fingers and wrists in a pre-determined and controlled way. At the same time, they must be able to get a good grip on their pencils. It is only after children attain mastery over both these skills that they are able to write alphabets properly. By six or seven years, most

children are ready to do writing tasks that require small, controlled strokes, such as writing within small spaces or between closely spaced lines, like those in a notebook. But before they can competently do this, children need to go through the process of using large, free spaces to scribble, moving gradually to broadly spaced lines, and, finally, to regular notebooks.

A school building can help bridge the gap between the curricular need of learning to write alphabets and the developmental process of using the wrist and fingers to do so. The dull and drab window grill can be a versatile medium here. The grill bar with moving beads can be used to practice wrist movements and also be made to look interesting by creating patterns that cater to some essential writing needs of young children.



The rods or bars in windows, on railings or along the steps can be moulded into different patterns of varied complexity. These patterns can be based on the wrist and finger movements required for writing alphabets. Children can either move their fingers or a bead/ring along the moulded grills. These patterns may serve as a tool for children to practise writing movements and, in the process, strengthen their wrist movements, finger muscles and finer motor coordination.

Finger movement can also be practised on engraved/grooved patterns in the plaster as shown earlier.

Word Wall

A large part of learning to read and write happens unknowingly – simply by being exposed to letters and words in the environment. Children tend to learn alphabets, words, grammatical structures or connections between words by just looking at them over and over again. If the learning environment provides spaces where words are visually accessible to children all the time, they are likely to learn them much faster. There is the added advantage of being able to self-correct. Children can compare what they have copied with the original words and quickly refer to their 'resource', because it is in their immediate vicinity. Such a space backs up beginners, and helps children who may be afraid of venturing into or have problems with spelling, reading or writing.

The Word Wall is intended to be a helpful friend for children who are struggling with reading and writing. It is a space where children can interact with words. This wall is a chalkboard surface with tables where a teacher can write words that children encounter in various textbooks. The idea is that this vocabulary is accessible for use in the class. These words can be classified in different ways and through different activities so that children may be helped to make these a part of their active vocabulary. This idea also assists children in dealing with grammar in creative ways. The Word Wall, with an alphabet border, can be used to generate and reinforce vocabulary and make it visually accessible for usage as well as for a variety of language games. Shown here is just one possibility of using the Word Wall for sentence formation. This may be used for sorting parts of speech, sense words, word meaning, opposites and related words etc.

Trails to Explore

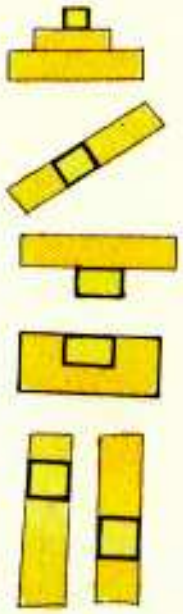
Treasure hunts, riddles or clues
Can become fun ways to learn too!

Riddles, finding clues, treasure hunts and playing detective are an intrinsic part of a child's make-belief, fun world. While such activities are considered separate from 'work' or serious stuff of classrooms, it is true

Clue boards camouflaged in the building for Trails to Explore

that children do not always connect textbook learning with what they see, do and experience in their daily life. Such linkages must be consciously planned so that learning becomes meaningful.

Trails to Explore attempts to create these linkages - between various language and mapping skills that children learn in class and the possibilities of fun that a built space throws up. The trails have clues that use language patterns – instruction, description, giving directions, naming places or objects – that are part of the curriculum. Using these, children not only have fun exploring the spaces around them but also learn to give and follow directions, identify landmarks and develop skills for route cognition – all of which are real-life situations. These clues are written in interesting ways on Clue-Boards, which are writing surfaces of different shapes with one common feature to identify them as a 'clue'. This common feature is a tile that becomes part of the writing surface. To 'hide' the clues in the built environment, these differently shaped clue boards are camouflaged by merging them with the existing background in a variety of ways, as shown. Here letters from a word are written on different clue boards and children are locating them. Can you identify what they are looking for?



Different shapes of clue boards

Creative expression

Each child brings to the learning environment a unique combination of experiences, skills and perceptions while exploring or using an activity or material. It is important that a school does not limit the natural learning processes of children and allows open-ended activities to suit individual needs and skills. But that's exactly what happens because most curriculum-related activities are convergent in nature. The natural processes of learning may be hampered if the children are confined to structured classroom activities. A school must have learning resources to facilitate creative expression of children. Wall Boards, for example, provide spaces for open-ended creative experiences with a variety of shapes and patterns that the children find in their world.

The shapes can range from those of leaves, alphabets and thumbprints or regular geometrical figures to irregular squiggles. This kind of active engagement provides multiple learning experiences in language, art, geometry, nature appreciation and other sensory perceptions in non-threatening and enjoyable ways. Placed in informal settings, Wall Boards can have borders that provide a visual guidance for using them. In many existing schools, the wall of up to a height of about 150 cm, invariably, needs repairs. The following ideas lie in this 'repair' zone. Since this is accessible space for children, the ideas can be easily integrated with repair work.

Children's Wall

These are wall surfaces on which children are free to express themselves. They may like to make shoe or palm prints, paint a hut or scenery or just scribble a thought or naughty graffiti. This surface can have a height of up to 150 cm from the ground. This is the maximum that the average child in elementary school can reach comfortably. However, different Wall Boards may have different heights for different children. The width will depend on the availability of space. The surface may be painted in any light colour and

made in a portion of the boundary or parapet wall that children are most likely to visit. This portion must be easily accessible and visible from a distance. It must have, at least, a 6 meter-wide space in the front for small groups of children to watch the wall. It should have an all-weather, exterior grade paint to make it rough and tough for handling by children.

Dot Boards on Floors and Walls

Dot Boards are writing surfaces with dots, which can be joined in a variety of creative ways using chalk. The dots can be spaced regularly or in a staggered manner. They can be painted, engraved, embossed or occur as protrusions which can be used as pegs. These boards can be used for drawing or doing activities related to mathematics, language and art. These can also be used as devices for providing wide-ranging experiences of geometrical concepts. Drawing patterns, geometrical shapes, alphabets, outlines of objects, traditional symbols or symmetrical figures etc. Dot Boards are a versatile design idea. A border surrounding the dotted surface may contain a user's visual guide for children. The boards may also provide different ways of reinforcing concepts and textbook learning.

Grid Boards

Grid Boards have a matrix of equal-sized squares arranged in 10 rows and 10 columns. They can be made on walls, floors or glass windowpanes. Since such grids are in the built space, they have the added advantage of being available to children for use at all times. They can be used for interactive and creative, teacher-directed or independent activities in mathematics, language, mapping, art and skill development.

A wide border, surrounding the grid, helps in providing additional surface for writing in relation to the activity inside the grid. Grid Boards may be made as an extension of the blackboard. Placing them next to the blackboard assists children in using the grid for a range of learning activities. For instance, suitable vocabulary can be written on the Grid Board before making a word ladder. These are useful for all grades. Their placement on the wall must be appropriate for the age group that is likely to use them.

Learning to conserve water

Water is becoming scarce by the day. Yet, most of us continue to waste it. Schools are the right place where the value of water can be inculcated early into the children so that they learn to conserve and harvest every precious drop.

Waste Water Herbal Garden

Every drop counts
It can even help to grow plants
Water that was going waste
Can a little garden create!

Most schools need to have a drinking water point – whether it is a hand pump or a tank with taps. If there is water, there is bound to be some spillage. At the barest minimum, about 10-15% water runs off as waste. Can we not use it creatively?

A sensible place to grow flowering annual/perennial plants is in the beds near such drinking water points or other taps. Here, they can thrive on the run-off waste water. Instead of making puddles or simply running waste, this water can be channelled to such row(s) or beds. Also, instead of growing just any species, the school can choose flowering and other plants with medicinal or other useful properties. This can become a mini botanical herbal garden and the pride of the school.

A small, fully covered underground system can be created to retain waste water for a longer duration while allowing excess water to recharge the ground water. This does not allow mosquitoes to breed. A few suggested hardy plants for the Waste Water Herbal Garden:

- Calendula can be grown in winter (autumn sowing) – This is an amazing and instantly usable medicine for fresh cuts, wounds and burns.
- Brahmibooti is a relaxant, cooling neuro-tonic.
- Ghritkumari (*Aloe Vera*) is a hardy, perennial succulent with medicinal and cosmetic properties. It can be used for cuts, burns, dryness of skin and scalp, and stomach disorders etc.
- Varieties of *Tulsi* (holy Basil), with exceptional healing properties, can be grown. It is used to treat coughs, colds and fevers.
- Herbs like *Pudina* (Mint), *Dhaniya* (Coriander) and *Saunf* (Fennel) are easy-to-grow, directly useful plants.
- Bushes like *Nirgudi* (Vitex nigundo), *Karhi Patta/Meethi Neem* (Karhi leaf, important iron source, digestive anti-oxidant, disinfectant used for leprosy and skin diseases etc.) and *Mehndi* (Henna, used for treating leprosy, skin diseases and ulcers. Its flowers yield perfume) etc. can also be grown.

Enhancing Rainwater Harvesting

Have we ever thought why we face water shortage in spite of so much rain? The reason – we have not reflected enough on the value of the raindrop. Rain occurs in short spells of high intensity in several parts of India. But most of the rainwater falling on the surface tends to flow away rapidly, leaving very little for the recharge of groundwater. Consequently, many parts of India experience shortage of drinking water. What can schools do to prevent this situation? Several schools have loose dust/soil which, due to low moisture content, causes pollution. Water harvesting enables recharging of ground water and helps maintain balance. It also increases the moisture content of the soil which, consequently, reduces pollution and creates a comfortable microclimate for plants.

Rooftop rainwater can be directed towards a few chosen spots, through open gutters of simple tin sheets placed at the edges of the roof. This water can also be directed to rows of shrubs, small trees or trees in the vicinity of buildings. This is a very exciting idea because a large part of the requirement of trees and other plants can be met with this water. The leftover water will gradually percolate into the ground.

With simple, but innovative landscaping, it is possible to send rainwater, in an entire school area back into the earth instead of letting it run off into drains or stand in the open. Such a plan will reduce the need for any extra water for plants. It is like setting up (or rather helping nature evolve) a self-sufficient irrigation system! The rest of the rainwater can recharge the water table. Safely covered recharge pits and trenches, and soakaways, as well as permeable surfaces in schools to promote the percolation of water through soil strata at a shallower depth are good ideas to do so. While these may sound a bit modern in terminology, some of these are traditional methods across the world to conserve and harvest water through different structures.

Learning from the natural environment

Open your eyes big and wide
Look around, what a lovely sight!
In your school, trees big and small
With so many things to offer you all
Leaves, seeds and flowers, oh look!
Shapes or colours, why just in a book?
Play with them and learn with fun
Let nature charm with many a lesson

Natural Learning Materials

The natural world offers rich experiences to children. Plants, with their leaves, pods, fruits, flowers and seeds, and trees with their roots, trunk, bark and branches, offer a variety of sensory materials in terms of their shapes, colours, sizes and fragrances. To have them in the school environment means offering children a treasure of activities that can simply happen or be done using these resources. This way they get exposed to the diversity of nature and can also associate what they study in books with what they see around them. While these materials can become a learning resource for counting, craftwork, pattern making and recognising colours, children can have fun making little toys from them. Select only those plants species from which natural materials fall on their own or can be gathered without harming the plant. Finally, greater the diversity of plant types (trees, bushes, grass, herbs), wider the range of natural materials available in the school. A few suggested species are:

- Amaltas *(Cassia fistula)*
- Curassia *(Plumeria species)*
- Gulmohar *(Delonix regia)*
- Imli *(Tamrindus indica)*
- Kanak Champa *(Pterospermum)*
- Kaner *(Nerium oleander)*
- Neem *(Azatdirachta indica)*
- Ratti *(Abrus precatorius)*
- Siras *(Albizzia lebbeck)*
- Sarkanda Ghas (Stick grass)
- Sticking Flower wild grass

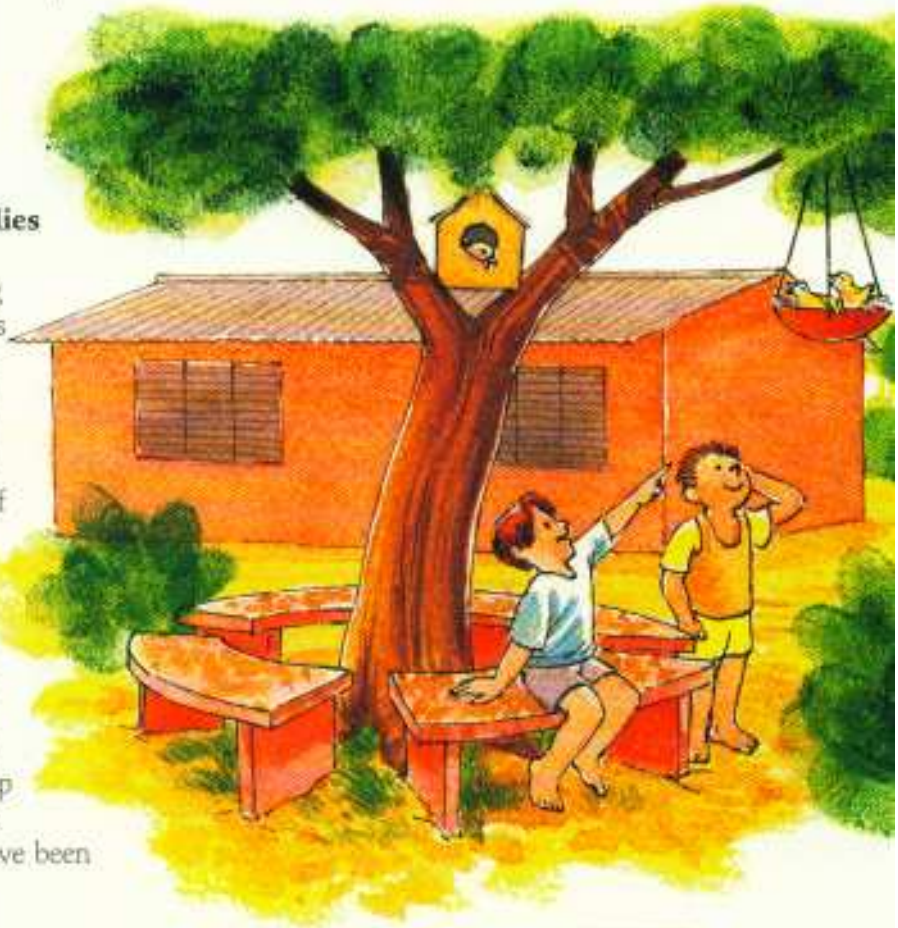
Materials from the above species can be used to generate some interesting learning experiences for children:

Nature as a resource

- Use seeds as marbles and as counters for board games (see *Board Games* on page 52).
- Reinforce a variety of math concepts like multiples, grouping and addition through leaves and seeds.
- Make available resource material to create models and toys, conduct simple experiments or create craft and art objects.

Nature to enhance appreciation

- Understand nature through patterns, shapes sequences, textures and materials in leaves, flowers, branches, trunks, stems and roots etc.
- Observe and understand life cycles of trees and plants.
- Experience and understand interdependence in the natural world.
- Develop concern and care for trees and plants.
- Enhance the feeling of discovery through opportunities of observing and exploring.
- Develop sensitivity towards biodiversity.



Inviting more Birds, Bees, Butterflies and Insects ...

The idea behind selecting and planting species that will invite more birds, bees and butterflies is to promote a diverse and fuller interaction of children with nature in a school. This is possible by bringing in or enhancing their natural habitat, primarily through provision of food sources, shade, nesting opportunities and water. Planting and encouraging an assortment of indigenous plants is a good rule of the thumb. In fact, it is a sure way of getting many birds, bees, butterflies and insects in the garden. If the waste water channel is open, it can double up as a constant water source for birds as well. Some such exceptional plants have been listed as suggestions:

Trees	Whom does it attract	What attracts them
Guler *(Ficus glomerata)*	Birds, squirrels	Fruits
Jamun *(Syzigium cumini)*	Birds, squirrels	Fruits
Drumsticks *(Moringa oleifera)*	Birds, bees, butterflies	Profuse blooming flowers
Palash *(Butea monosperma)*	Birds, lac insect	Flowers, lac
Ber *(Zizyphus mauritiana)*	Birds, children	Fruit
Shehtut *(Morus alba)*	Birds, children	Fruits
Banana *(Musa speaes)*	Insects	Honey and pollen
Siras *(Albizzia labbeck)*	Birds, squirrels	Pods
Shrubs		
Calliandra *(Calliandra calothyrsus)*	Parrots	Flowers
Sthal kamal	Moth, bees	Flowers
Murayya *(Murraya paniculata)*	Butterflies, bees	Flowers

Learning to conserve environment and energy

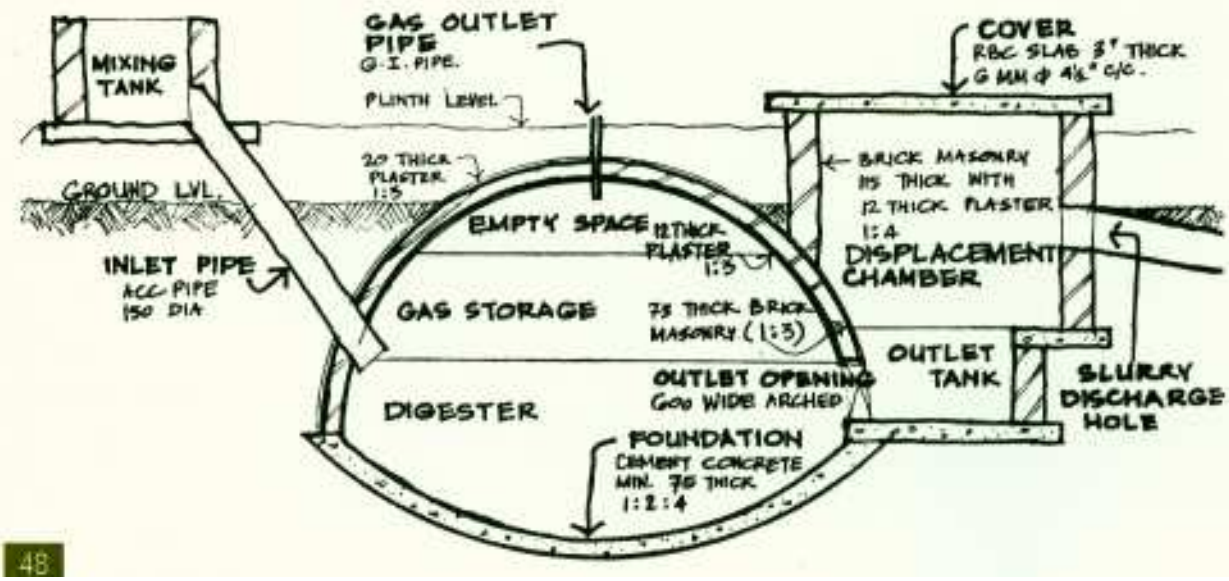
Environment-friendly generation and consumption of energy has become a global phenomenon. Earlier, the issue did not apparently affect individuals. Therefore, it was not considered significant enough. However, with energy and fuel prices shooting up, the average person is feeling the pinch. Schools can become effective tools to create awareness about issues related to energy, ways in which it can be generated and used. There is no telling how and when exposing several young minds to these ways and devices in school may yield efficient and creative energy solutions in the future. When a child sees how hard it is to generate energy, she/he will also realise its value and learn to consume optimally.

Since mid-day meals have become common across elementary schools and several alternative school centres run at night, the energy produced here needn't be only for demonstration. It can be effectively used to cook food in the day and light lamps at night. In other words, such energy devices will not serve only as models. They will enable schools to effectively practice eco-friendly energy generation and consumption. Some of the following devices can provide a wonderful experience for children to know the power and potential of sunlight. Here are some ways in which children can participate in the generation of renewable energy:

Energy from Cattle or Human Waste – Biogas Plant

Cow dung has been traditionally used as fuel in India. But the rising cost of other energy sources has led to greater use of dung cakes even in the recent times. Dung is a good bio-fertiliser but burning it directly is not a good idea. Burning destroys the land nutrients essential to grow fodder for animals (the sources of dung!) as well as cereals. A seemingly unrelated issue is of hygienic disposal of human excreta, which is a major problem in rural as well as urban communities. Is it not possible to generate energy from dung in such a way that the problems of burning are resolved and the land gets its nutrients back? Interestingly, both

Plant Capacity (M³ biogas per day)	Requirement of dung	No. of cattle required	One meal can be cooked for (No. of Children)	Digested manure production (kg per day)
1	25 kg	3-4	6-10	10
2	50 kg	6-8	10-20	20
3	75 kg	9-10	24-30	30
4	100 kg	10-12	32-40	40
6	150 kg	15-18	50-60	60
8	200 kg	20-24	65-80	80
10	250 kg	25-30	80-100	100



cattle and human excreta can be used to generate energy and produce manure simultaneously.

But what does all this have to do with a school? Well, it can be the site for a biogas plant. Children can learn about and participate in the entire process of production of manure and generation of energy, beginning with obtaining dung, maintaining hygiene, using manure and cooking with biogas etc.

The fixed dome-type biogas plant (*Deenbandhu* model) is more suitable for schools. This is a unique type that combines all the components in one unit and does not require a separate gasholder (this reduces maintenance).

Solar Cookers

Solar cookers trap the rays of the sun to cook food. A normal – 0.6m x 0.6m – size box-type solar cooker with four pots can be used to cook for eight to 12 children. It supplements cooking fuel. This cooker can be used to make rice, *dal* (pulses), *kadhi* (curry), vegetables, meat and fish dishes, snacks, soups, sweets, desserts, sauces, jams, pickles, biscuits, cakes and puddings. However, it cannot be used for frying or for making *chapattis* (bread). The outer box is made of fibre-glass or an aluminium sheet, a blackened aluminium tray, a double glass lid, a reflector, insulation, and cooking pots. A reflecting mirror, fitted on the inside of the outer box cover, reflects solar radiation and helps in increasing the solar energy input. Raw food is put in the cooking pots, which are placed on the aluminium tray and covered by the double-glass lid. The cooker is kept facing the sun. The advantages of solar cooking are:

- Box-type solar cooker is durable and simple to use.
- It saves time and works on its own. The cook is free to do other things while food gets cooked.
- Food never gets burnt.

- Solar cooking is a slow process, and, hence, ensures better and more nutritious food.
- It does not pollute the environment, and conserves conventional energy.
- Solar cooking involves no recurring expenses on fuel. If used regularly, a normal solar cooker can save three or four Liquid Petroleum Gas (LPG) cylinders per year.

Energy-efficient Stove

Large parts of rural India still use the traditional firewood-based stove (*chulha*) for cooking. Its energy efficiency ranges from 2 to 8% only. It emits smoke and wastes wood and, hence, is not eco-friendly. Schools in such areas also use such stoves for cooking. If some of the above mentioned cooking options are not feasible, an innovative stove design can be considered. The stove can be portable (made in metal) or fixed type (made with clay and sand mixture). In this improved stove, combustion of wood takes place in a closed hearth, which means that the fire stays protected from the wind. The design allows use of two to four pans, permitting a certain amount of heat recovery from hot gases that goes waste in traditional stoves. It has a chimney to let in draught that is necessary for combustion and venting smoke from the kitchen. Together, these features improve the efficiency up to 22% and reduce wood consumption to one-third what's used up by of its traditional counterpart.

Solar Lantern

Lanterns have been used traditionally for lighting homes at night in villages. A solar lantern converts solar energy into electrical energy that is stored in a sealed maintenance-free battery (of 12V, 7AH [ampere-hours] capacity). It is a portable lighting system, light in weight and, therefore, ideal for both indoor and outdoor usage. It can provide light for three to four hours daily, and is designed to have a three-day 'autonomy', that is, it can function (in this manner) for three days without sunlight. The compact fluorescent lamp (CFL) in the lantern is of 5W or 7W rating – providing sufficient light for a group of five to eight children.

No installation is required for a Solar Lantern.
During the day, the photo-voltaic (PV) module (which converts the incident solar light energy into electrical energy) is placed in the sun and is connected through a cable to the lantern unit. This, in turn, charges the battery. An indicator light indicates the charging of the battery. The lantern is used stand alone at night, wherever required. It is a useful device for running an alternative education centre, which usually function in the evening or at night, in remote villages. The PV module must be placed at a height from where children can see it (and, occasionally, clean the dust), and also where it can receive sunlight during the day. For older children, it can provide longer study hours. It also reduces the risk of fire mishaps.

Ideas for sheer fun

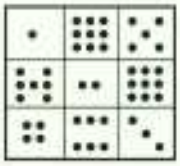
Fun is as important as learning. Some times, it is important for the school to provide opportunities to children for pure fun without encumbering them with 'learning'. Fun design ideas provide lively and interactive settings to children for their games..

Children need to belong to a school. They need to feel a sense of ownership. What better way to give them this feeling than to provide space for familiar games like hopscotch (*stapu*) or board games that they love playing! These are games that can be changed and moulded to suit different needs or moods! Or games that provide endless hours of fun and engagement, in spaces that children naturally prefer!

Board Games on Floors and Seats

A few lines on the floor
A couple of seeds
A dice that you throw
Is all that you need,
For fun and games galore
Such a wonderful treat!

Indigenous board games provide an important context within which children learn to follow rules, develop strategies, innovate techniques and, at the same time, learn to win or loose with dignity. All these are important life skills. While such games should be an integral part of any school, there are a couple of reasons why they are not. One, it is difficult to maintain them, and, two, it is not always possible for schools to provide enough games for all the children.



Board Games on the Floor and Seating Spaces along corridors or outdoors can provide a viable solution. Such permanent and accessible spaces can be used for creating built-in formats of familiar board games. Locally played indigenous games can, thus, become an integral part of the physical environment of a school. Children can play these games during or after school hours without worrying about breaking or losing them. All they need is some seeds or natural materials and a dice, and the games are ready to be played! A simple, alternative accessible dice has also been suggested, so the children don't need to go looking for one! The game consists of a flat grid of six or nine squares on the floor with numbers (1 to 6 or 9) written on it. Children can throw a pod over this grid and allow it to fall randomly on any number. That's the Flat Dice!

Mirrors on Walls

Mirror,
Mirror on the wall,
Who is the fairest
or the tallest,
or the weirdest, or the shortest,
or the fattest, or the thinnest,
of them all?

Mirrors can be fun. They also teach children many concepts, such as what is left and right, image inversion and reflection etc. Apart from the fact that they are easy to integrate with the building, they also have immense potential to be an educational toy.

Unbreakable mirrors can be made from acrylic or polycarbonate sheets. They can be fixed vertically on a wall with enough space for children to move back and forth in front of the mirror as they observe the changes that occur with the movement. The mirror strip should be, at least, 60cm wide and 120cm high and should be fixed at least 30cm above the ground. The mirror can be given a concave or convex shape by shaping the plaster over which it is going to be fixed. This sheet, at least 0.2cm thick, must be fixed over the wall with long sturdy screws, rubber washers and rowl plugs. Similarly, a variety of mirrors (showing different degrees of distortions in the reflection) can be fixed. So, children can be tall, or short, fat or thin in the mirrors and have a good laugh at themselves!

Jaali Wall - Play of Sunlight

Have you seen a spotted deer in a school? Well, all you need is a little bit of sunlight to see it! Play of Sunlight is about developing such fun possibilities using certain integral elements of the building that also create interesting visual effects.

Sunlight can bring a lot of cheer to spaces, if used in moderation. One of the ways to do so is to use brick *Jaali* Walls. *Jaali* is a panel of small perforations in an opening. Designed sensitively, a *Jaali* can make interesting patterns of sunlight on walls and floors. Besides, it has a thermal advantage as well. Too much of sun in a tropical summer is rather discomforting. A *Jaali* allows both air and sun to enter a space. However, the intensity of sunlight gets diffused when it passes through the *Jaali*. In fact, it can cause the hot air outside to lose some of its heat when passing through it. When the outside air passes through the small perforations, the air pressure increases suddenly and then drops as soon as it enters the interior. This causes the air to expand which makes it cool. Ideally, it should be located in sun-facing sides of corridors.

Addressing the socio-cultural, economic and educational background of children

A school cannot be isolated from the socio-cultural, geographical or educational milieu of its community. Some schools may be so remote that they don't receive enough TLM or not in time. Some times, children don't have access to stationery because there are no such shops or they can't afford to buy those items. In such scenarios, it becomes incumbent on the school to be responsive towards the children and the community they come from. The following ideas may be useful:

Tracing and Rubbing Surfaces

Alphabets, leaves or number shapes,
To trace and use in many ways.
Feel them, print them
or trace them out.
Discover these shapes
in the world around.

Tracing and rubbing surfaces are a unique way to replicate certain essential TLM or stationery items in the school itself. Simple shapes and outlines like maps, money, geometrical shapes, alphabets or numbers, leaf shapes, outlines for origami etc. may be engraved on ceramic tiles or painted on window glass panes. The tiles can be fixed at accessible locations on walls, platforms or other horizontal surfaces. Children can transfer the shapes on to paper by pressing or rubbing it against the engraved lines on the tiles. The glass on the lower portions of the windows can be used to trace by putting a paper on it so that they are available to children at all times. These lines can act as guides for folding paper or providing shapes for colouring or other classroom activities.

Children don't need a pencil, rubber, or scissors for tracing from a ceramic tile. All they must have is some notebook-sized paper. These tracing tiles are accessible, dependable and low-cost duplicating medium available within the school. The fabrication of such tiles becomes viable in large-scale repair or construction plans for schools.

Counter Window for Simulating Life Situations

Children use make-belief and pretend-play to relate to the world around them. Playing out adult roles, they, also learn to prepare themselves for a future world. They also need to communicate with their peers, older and younger children. They want a space where they can do all this in an unobtrusive way. That space is the Counter Window, which allows children to do 'as the adults do'. A currency or ticket-tracing tile on the counter platform can enable children to make their own ticket and money for buying or selling. Such provisions in the secure environment of the school can enable even girls to simulate real life situations, some of whom are not allowed to go out. For more details, see Counter Space with Amphitheatre for Interaction on page 66.

Creating a learning environment while repairing or modifying the building

A survey in India a few years ago revealed that about 70% school buildings need some or the other kind of repair and maintenance in their lifetime. Often, this exercise is seen as construction activity and elicits little interest from the 'cognitive' community (teachers, headmasters, children) of the school system even though it directly affects them. The construction and administrative communities (architects, engineers, education administrators) also do not see any connection between construction and/or repair and the core activity of education. The truth is a range of learning aids and spaces can be created in the school during repair or construction. The following examples demonstrate this:

A corridor in need of repairs

Repairing a corridor

While re-plastering wall and column surfaces, a range of Wall Boards, Fraction Tiles on Walls and Floors etc. can be made. Board Games can be integrated on the floor while repairing or re-laying it. A dilapidated corridor with broken plaster and walls can be made livelier.

A corridor with learning elements integrated during repair of plaster, floor and structural elements. It is evident that a lot of learning material can be made while plastering, laying the floor and painting the building.

Enhancing natural light and ventilation in classrooms

Very often, classrooms get inadequate natural light and ventilation. Simple improvisation, without disturbing the existing structure, can enhance both these elements by 15 to 30%. This is a simple method for openings in masonry walls:

Side jambs and bottom sills of windows and ventilators can be splayed inwards. This increases the surface area for internal reflection. It also allows movement of air towards the floor, which is where children in primary classes in Indian schools usually sit and work. This does not damage the structure and the existing window shutters and frames can be utilised. Window sill levels at 90 cm or more from the floor can be lowered to 60 to 75 cm. Here again, only the shutter and frame will need modifications while the structure will remain untouched. Painting outdoor walls or walls facing classroom windows (for example, boundary wall or wall of a neighbouring building), in a light colour or a simple lime white wash also enhances ambient light significantly. Similarly, painting window and door shutters and splayed jambs with a light, bright colour help in improving internal lighting during the day. These also help introduce a gradient of light in the space inside.

Classroom with dark interiors

Classroom with splayed window jambs and light coloured surfaces with improved, graded natural light and ventilation.

Innovative repair of backyard space

Very often, school buildings are not well sited. They may leave an abandoned or unusable backyard. Sometimes, they may block natural drainage during rains, causing water to seep into the foundation. This results in the walls to settle and crack. Well, all it needs is some imaginative repair work!

After repairing the foundation and the wall (by literally 'stitching' the masonry or making a new wall using old materials), one can raise a plinth protection that uses the rubble left during repair work. The plinth protection can be given different shapes and forms to accommodate different peer group sizes. It can be wider under a shaded tree to allow large group activity. Games and puzzles can be made on the plinth for children to play and learn.

An enlivened backyard space with plinth protection shaped according to different peer group sizes

A learning space located between two disjointed blocks.

Creating a learning space between two blocks

Many times, one adds to an existing school building outside the purview of any master plan. For example, a room may be built in a village school during the famine relief programme (to provide employment to a community) without integrating it with the existing structure. Consequently, the space 'between' the old and the new usually becomes 'negative' or unusable. With some inputs and minimal cost, even this can be made into a learning space for structured activities, as shown. Thus additional class 'room' can be created at a very nominal cost.

Summary

This section demonstrated how various built elements in classrooms, corridors and outdoors can be treated innovatively and how they can respond to children's behaviour and their aspirations, their socio-economic and educational background and to the differently able children. Alongside, it showed how these elements address school curriculum (mathematics, science, language, creative expression, energy and environment) so that they can be integrated while repairing or enhancing a building. A detailed inventory of nearly 150 design ideas is available with the bâlâ team for schools to choose from, depending upon their needs, situation and potential.

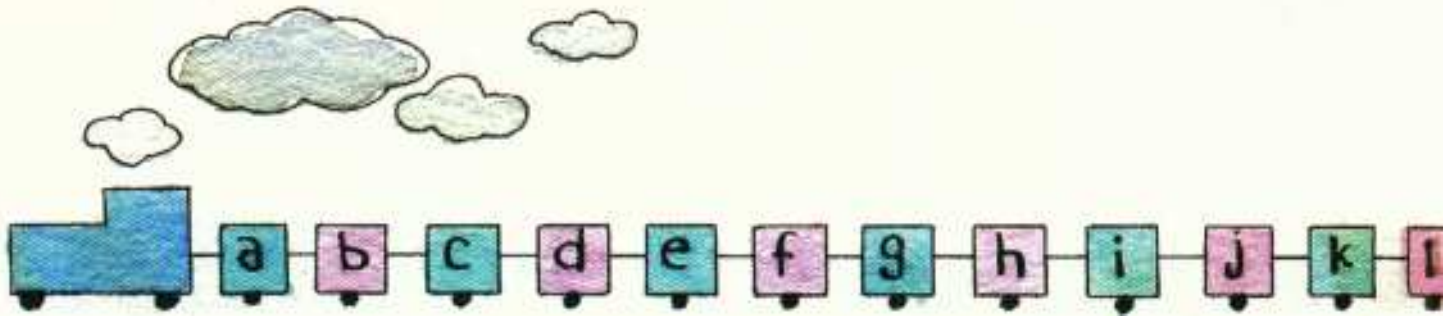
The next section shows how to put these diverse ideas together in different school spaces.

4 grouping design ideas for creating spaces in school

This section demonstrates grouping various design ideas in different school spaces.

Integrating the ideas to create playful spaces

Some representative spaces in a typical school are mentioned here. These spaces attempt to create meaningful and joyous teaching – learning situations – indoors or outdoors, structured or unstructured, formal or informal. Both existing and to-be-made schools can have these spaces. Each of the spaces can have ideas from different subject areas grouped to respond to child behaviour and activity patterns etc. The grouping of design ideas is only indicative. Each school is unique and should opt for spaces and their constituent ideas to suit its specific needs and environment. It is important to physically and visually connect these spaces. This will allow synergies from one space to flow into the other and help the teacher to handle a multi-grade situation.



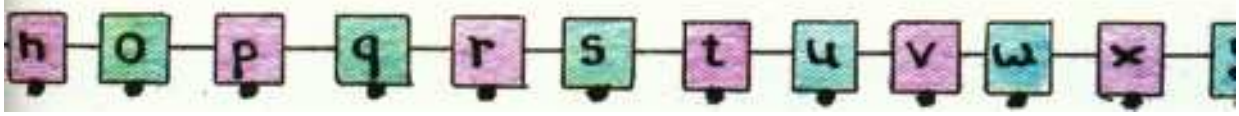
Indoor and Enclosed Spaces

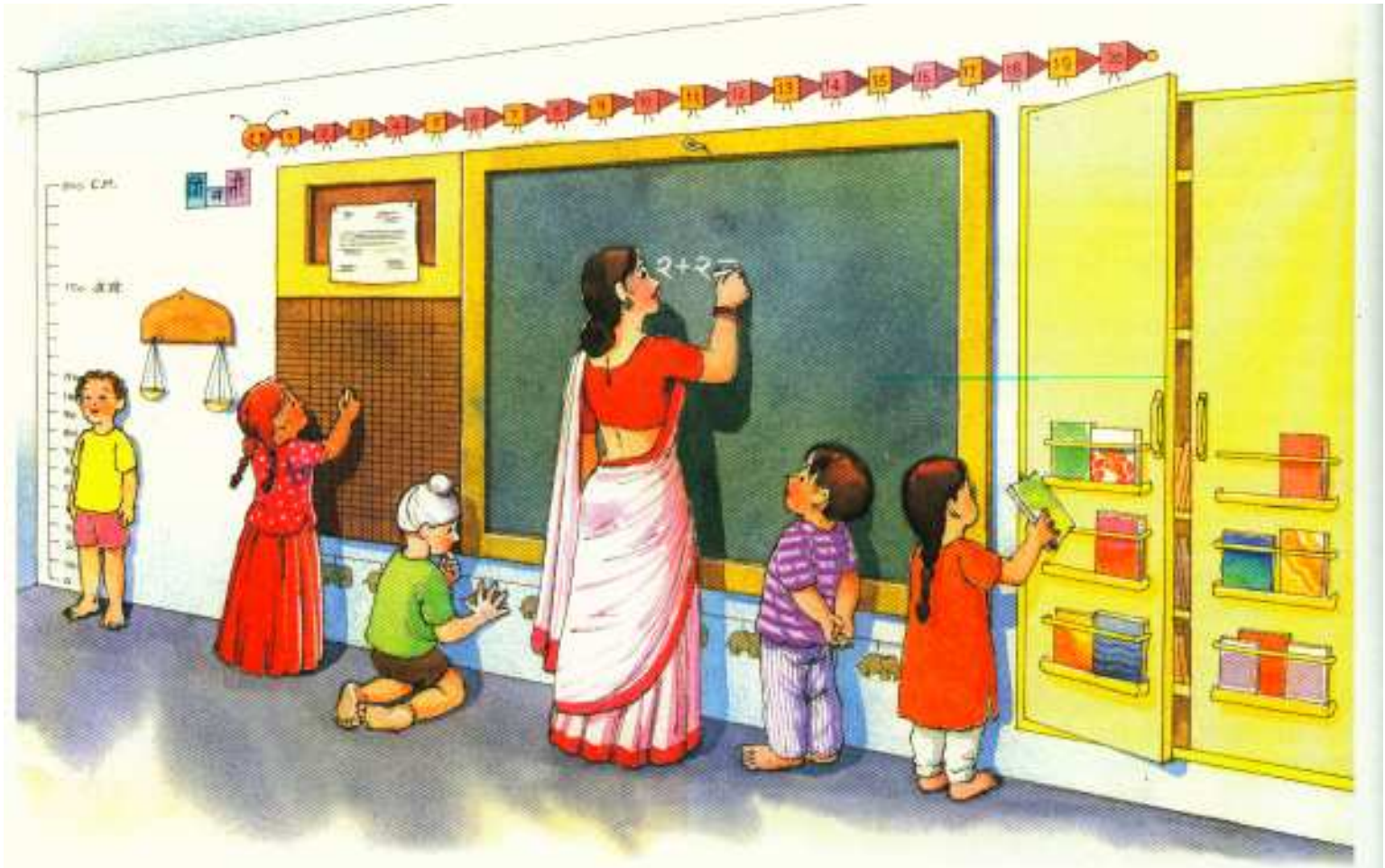
Classroom Spaces

In most schools, classrooms are the formal settings for learning. These can be enriched with design ideas. Some ideas are grade-specific. Some others are common to all the grades, and some may become more complex for children in higher grades.

The attempt here is not to give readymade solutions to make a model school. It is to indicate practical ways of incorporating various design ideas, most of which can be added to an existing school building during repairs to the wall or floor or for adequate light and ventilation, secure and functioning doors and windows and a functional chalkboard. A school can modify or opt for variations other than those mentioned here to suit its own peculiarities. For instance, the classroom shown here assumes that children do not sit on furniture and use the floor space instead. Hence, the wall surface and other elements like door and windows have been used as learning aids.

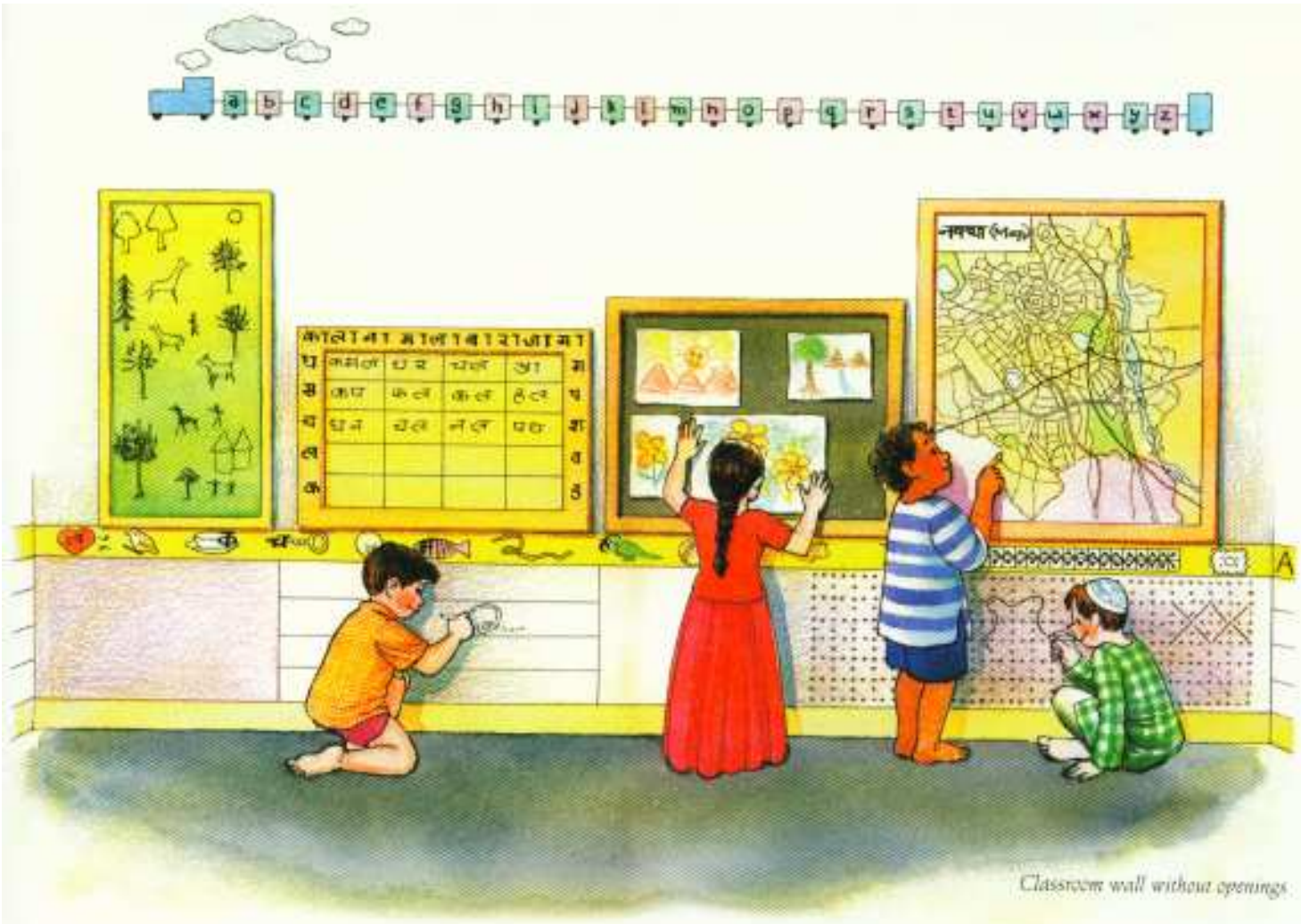
By spreading out the design ideas in a classroom, the relationship between the teacher and the children is likely to become more intimate. From being a teacher-centric class, it will become a child-centric, interactive space. The teacher can circulate and facilitate learning among students (instead of merely standing in front of them) as they use the design ideas on their own.





Main chalkboard wall of a classroom

Classroom wall with windows



Classroom wall without openings

Classroom wall with door

Circulation Corridor Spaces

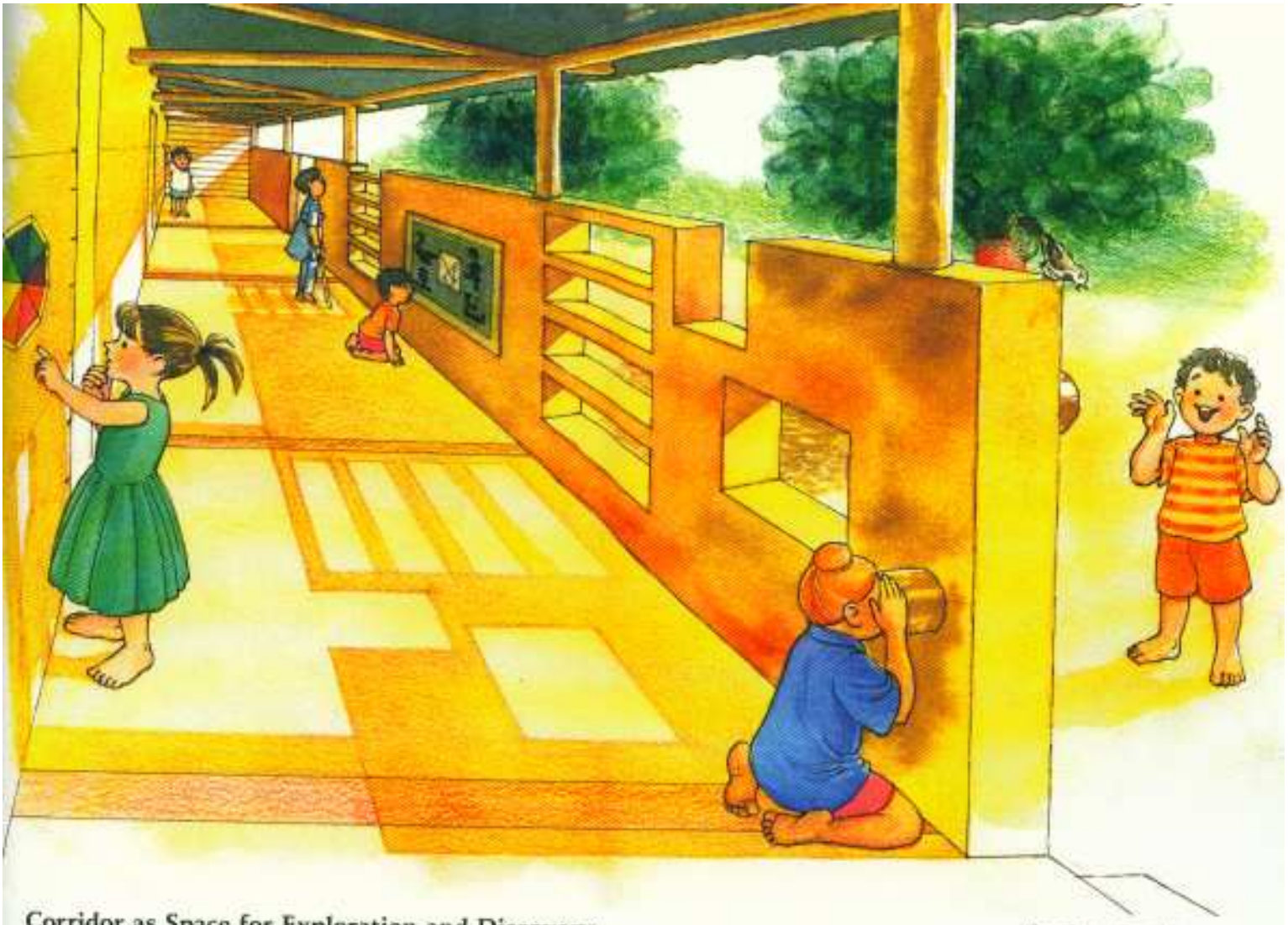
The corridor connects the inside (e.g. classroom) with the outside. Due to its unique situation, the corridor becomes a preferred space for children and adults alike and allows lots of interactivity. It can be a space to play, talk and eat or to view activities inside the class or outside. It can be a passage to run, walk and so on. It is a relatively 'freer space' in which children can make choices about what they want to do.

Corridors facilitate natural behaviour. The long linear space of the corridor allows children's participation and interaction from a distance. Children use pillars to hide behind or go around. The space between pillars defines territories that are used by different groups. Corridors may have a raised platform, which facilitates 'spectator behaviour', sitting and interacting in small groups. In a tropical climate as in India, corridors are 'all-weather' spaces with enough light, ventilation, and shade in the summer and warmth in the winter. But, often the potential of corridor spaces is not fully realised.

The following points are important while selecting design ideas for the corridor:

- Children's natural behaviour, such as their preference for using the edge of a space to do various activities, should be used as a guide to position design ideas.
- The choice and placement of an idea should be conducive to the existing corridor design and should not hamper children from walking or running through the corridor.
- Design ideas should be grouped to allow different groups to function efficiently.
- Design ideas must be placed keeping in mind the average physical dimensions of the children for accessibility.

Circulation corridor spa



Corridor as Space for Exploration and Discovery with Perspective Lines, Tangram Tiles, measurement sense through floor panel to estimate distance, Wall Periscope, Mystery Wall etc.

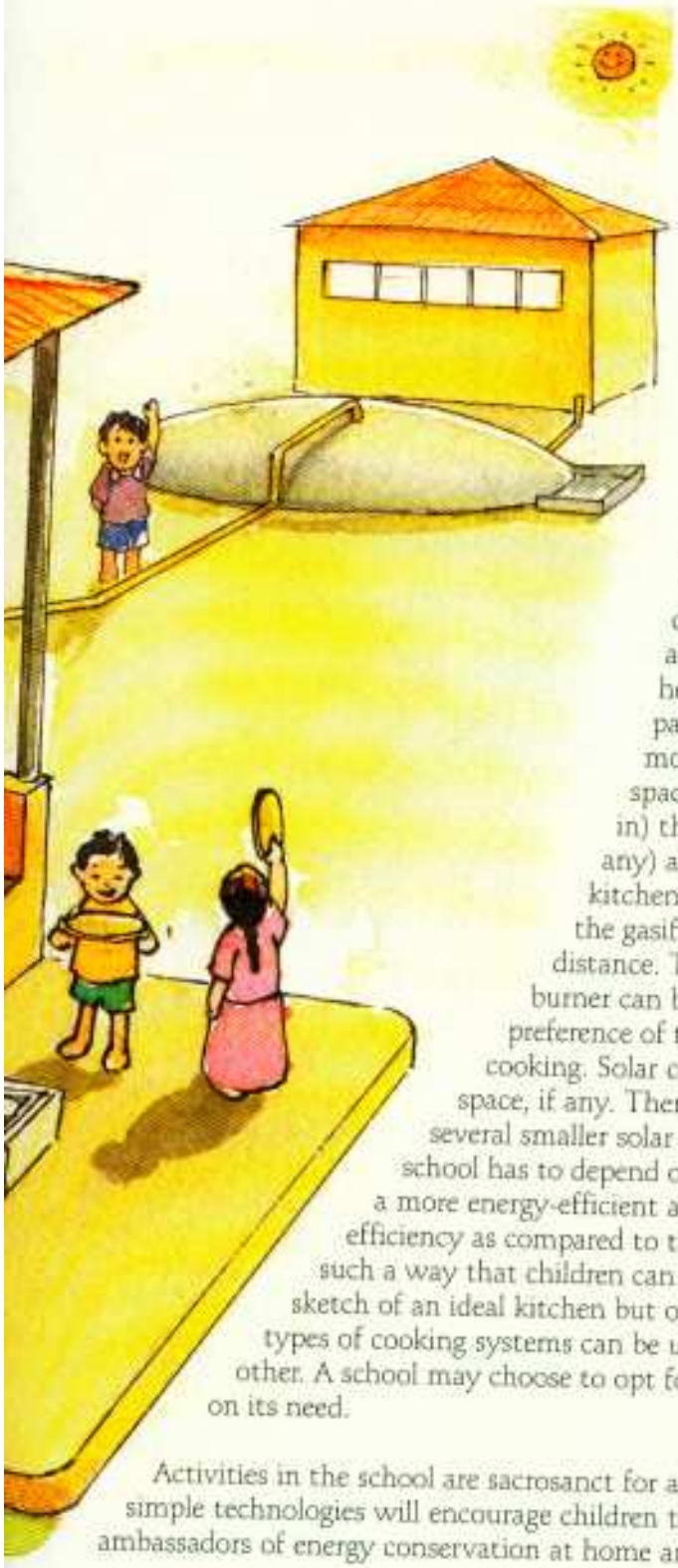
Corridor as Space for Exploration and Discovery

A child is a born explorer brimming with questions, looking for answers. A school can stimulate this natural curiosity and a sense of wonder in many ways. Providing several opportunities that allow active exploration and discovery within a defined setting can be one way. This setting can display or exhibit children's collections and explorations. It can facilitate interaction between peer groups and provide surfaces for project work. The space here is conceived as an open wall that is usable from both the sides and accessible to children at all times. In fact, the Mystery Wall (earlier mentioned as a place which registers peeping behaviour) is seen here from the inside. It can be located along the corridor as an interesting parapet wall. It can also serve as of a barrier to the rainwater that may enter the corridor and classes where the floor level is extremely low.

Kitchen Spaces for
Energy Generation and Conservation

Mid-day meals (at school) are an incentive for parents and attraction for children to attend school regularly. Many schools in India are adopting this idea. However, with the rising prices of kerosene and LPG and the growing concerns against burning wood, the cost of making the meals is also increasing. In fact, in many areas, the joint

Kitchen space with energy conserving and renewable energy-based cooking systems



cost of raw food materials and labour may be less than or equal to the cost of the fuel. This is likely to escalate in the future. Given this scenario, it becomes important to introduce ways of energy generation or fuel consumption that, at once, decrease the cost of cooking and become a useful learning aid for children to understand the concept of renewable energy generation and conservation.

The kitchen space, in most cases, is a semi-open area – covered at the top and open from at least two sides. This allows ventilation and also for children to observe and participate in the cooking activity. Typically, a member of the community helps cook the meals. An adjoining corridor or a patio space can be used to serve the meals. But most importantly, children and teachers in this space must be able to see (and if possible, participate in) the power generation activity, distribution (if any) and its effective use. Biogas can be used in the kitchen in such a way that it is visibly connected with the gasifiers even though the two are located at a distance. The stove can have one or two burners. The burner can be placed at a height, depending on the preference of the cook to sit on the floor or stand while cooking. Solar cookers can be placed in a south-facing open space, if any. There can be one large community solar cooker, or several smaller solar cookers placed close to the kitchen. In case, the school has to depend on fuelwood (as may be the case in several areas) a more energy-efficient and less fuel-consuming stove design (about 22% efficiency as compared to the traditional 8%) can be used and located in such a way that children can see it. It also generates less smoke. This is not a sketch of an ideal kitchen but only shows ways in which the three different types of cooking systems can be used independently or in conjunction with each other. A school may choose to opt for only one, two or all the options, depending on its need.

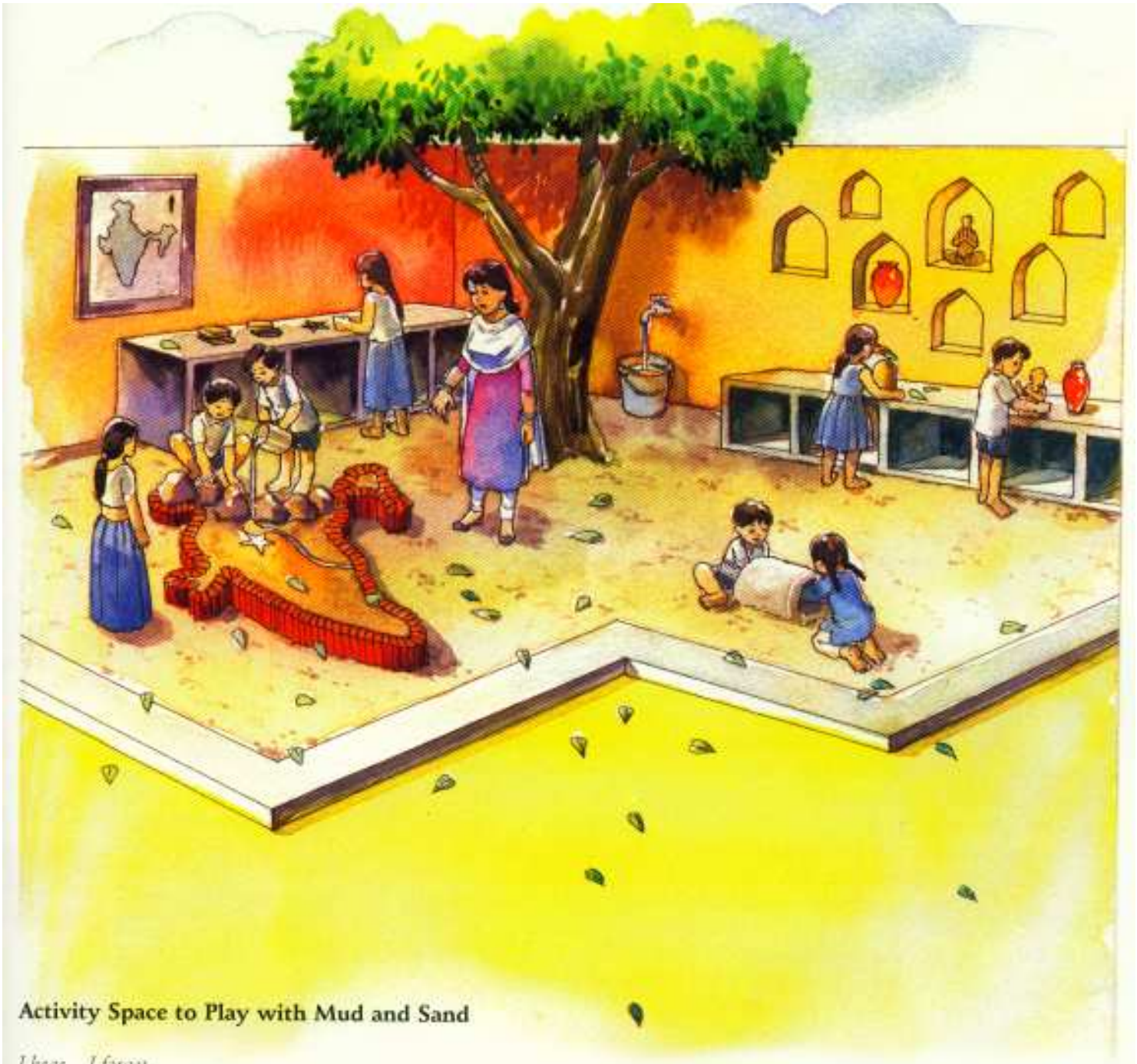
Activities in the school are sacrosanct for a child. Effective demonstration and use of such simple technologies will encourage children to think and, perhaps, even become ambassadors of energy conservation at home and in their neighbourhoods.

Semi-open and Outdoor Incidental Spaces

Counter Space with Amphitheatre for Interaction

This is the space where children can simulate the adult world and, unwittingly, prepare themselves for their future roles. It is an area which can have some Cubby-Holes and Peep Holes to keep things and a tracing corner with embossed outlines on tracing tiles for children to make their own money and tickets. It's a place where they can play schoolteachers, postmasters, shopkeepers or bus drivers, or use it as a cinema or train ticket window. The counter can become a hub of interaction among children of different age groups. It can, occasionally, also serve as site for informal teaching-learning sessions, and in the process, bring to life a dead corner or a useless backyard. A chalkboard here can be used to explain the mathematics behind a transaction at the counter. A bell near the counter can help call everybody for the commencement of an activity session. To make this space more generic in nature, it can have a small amphitheatre facing the counter space. This will lend itself to mulitpule uses and activities. A naturally sloping landscape or brick and stone tiers could be used to develop the seating area.

Counter Space with Amphitheatre for Interaction



Activity Space to Play with Mud and Sand

I hear I forget
I see I remember
I do I understand

Activity Space to play with Mud and Sand, with Outline Brick Map of Country

Children like touching, moulding and manipulating natural and other materials to create and explore. A space that allows children to get their hands and feet in the mud, freely explore sand, water and other natural materials is an important part of the setting. It has been suggested earlier that this space is ideal for them to interact with a three-dimension map of the country in which they can make mountains, valleys, rivers, plains, plateau and islands on their own and discover their attributes. The concrete experience, thus generated, to understand shapes and forms is likely to be more lasting than mere textbook information.

A glimpse of Space for Outdoor Natural Environment. It can have trees to invite birds and bees and to facilitate climbing and jumping, seats under the shade and Waste Water Herbal Garden. Some species that offer such attributes are also winter deciduous and helpful to keep buildings in shade.

Space for Outdoor Natural Environment

The natural world offers a fascinating canvas for a child's imagination. Sunlight filtering through intricate leaf patterns, fragile wings of a fluttering butterfly, rainbow in a dewdrop and the fragrance of a herb... hold the child in wonder and awe. Children begin to connect with this diversity and draw inspiration for endless hours of creative exploration. The open-ended, non-structured lessons in this space and the immense possibilities it offers help children to understand the world around them. Often, these activities happen spontaneously, but they can also be designed and facilitated to fulfill the physical, psychological, social and spiritual development of the children.

Only a secure, healthy and relaxed child can truly learn and grow. Greens in the school can enhance its environment – reducing smoke and dust and lending colour and serenity to a hard, grey life.

Here are some suggestions for landscaping and adding greenery to the school environment:

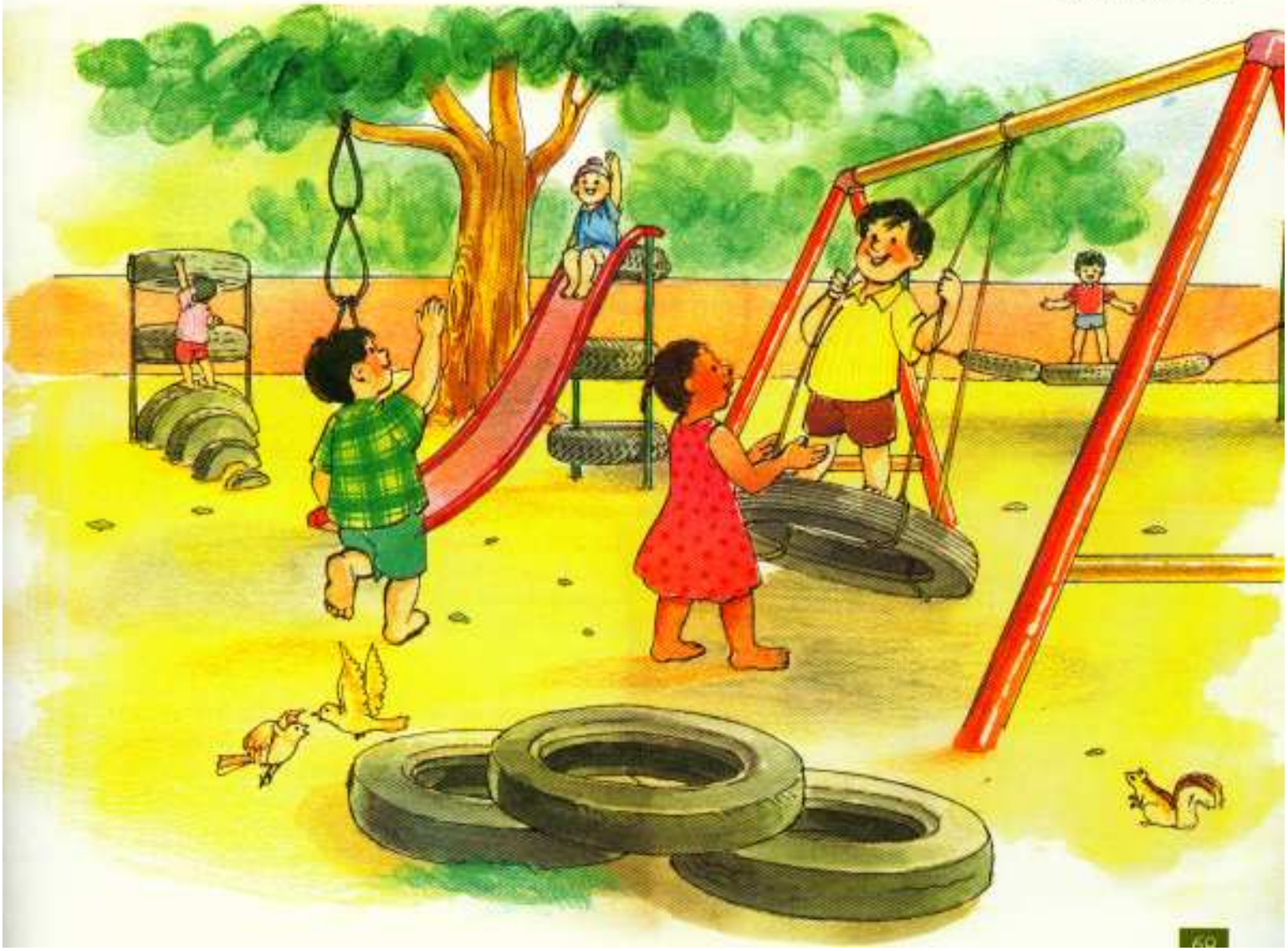
- Have easy-to-grow, hardy trees that do not require intensive care.
- Trees must have multiple attributes, of significance for the school – natural learning materials, features that invite birds, bees and insects and provide shade in summers etc.
- The species must cater to the needs and interests of children. The attention span of a child is considerably shorter than that of an adult. A child needs to visually explore growth and change. Some of the species grow rapidly to keep pace with a child's interest.

For the safety of the children, make a thick soft cushion of fine sand and mulch around trees where jumping and climbing activity is likely to take place. Details of trees and plants with multiple functions is available with the bālā team.

Space for Outdoor Play

Imagine a safe, stimulating space for adventure – climbing, swinging, building, imagining .... a space where branches become horses, boxes and pipes become houses or hideouts and tyres take on new forms! It is also a place that also allows quiet moments, or moments of din and fun, of playing with sand and making little dreams come true! There is a scarcity of play equipment in most of our primary schools. But a school can surmount this scarcity by using old discarded tyres, timber logs (available at junk dealers), few rudimentary hardware fittings, sand and a bit of imagination.

Space for Outdoor Play



5 planning and implementing bâlâ

This section can help a planner and administrator to incorporate the concept of bâlâ in the system.

The goal of bâlâ is to make schools a better place for children to contemplate and learn. Before introducing the concept, it is important to ensure if the school is ready to accept these ideas.

Understanding and leveraging within the entire school system

It is important to realise that the school environment has four distinct, but interrelated, domains: physical, cognitive, institutional and social. The physical relates to the built environment; the cognitive to pedagogy, teachers' capacity and the actual learning processes; the institutional to the educational policy, administration and management aspects; and the social domain is about the context in which the school is located. Every school may have one or more domains that are stronger than the others. For example, a school may have a good physical environment, an average cognitive environment, a non-facilitating institutional environment and an uninformed social environment. Thus, planning has to be flexible enough to accommodate such variations across these four areas and bring them to a level where the intervention can be taken forward.

Domains	Level 1	Level 2	Level 3	Level 4
Physical				
Cognitive				
Institutional				
Social				

Any innovation has to take cognisance of all these four domains. Intervention in one domain will require change in all the other areas in some way or the other. For example, a school, howsoever good looking it may be, cannot be effective unless the teachers are

sensitive towards the children or the ways in which they learn. Hence, it is important for them to have that sense of ownership and efforts may be needed to sensitise them. Similarly, if the education department officials at the cluster, block, or district level are not aware of or sensitive towards the children's needs, they may not even consider new, more imaginative proposals coming from the school. If the community is not aware or appreciative of joyful learning, it will want the school to enforce discipline and the school, in turn, will continue to be that uninteresting place churning out rote learners.

Innovative utilisation of existing administrative structures

Administrative structures and methods for planning and implementation are present across the states in some form or the other. The success of this work depends upon interlinking the existing units within educational systems because an innovative idea needs innovative implementation too. Many of the solutions suggested here have either been successfully tried earlier or are being used in some states in India.

Planning for bâlâ

Orienting the stakeholders about bâlâ

Before executing the ideas, it is important to orient the stakeholders in an educational process to innovations of any kind. This can be done through books, small pamphlets, coloured photographs and visuals, scaled models or organised presentations at district or block headquarters. There can be interactive sessions with small groups where the school environment, methods of teaching and use of space can be discussed. This will help the stakeholder to see the concept in the context of her or his own school. For example, a publication on Child Friendly Elements that included some bâlâ ideas was disseminated across India. Under the District Primary Education Programme (DPEP) some teachers and engineers in states like Gujarat and West Bengal picked up the ideas and made interesting learning interventions in their schools. Under the Sarva Shiksha Abhiyan (SSA), the Rajya Shiksha Mission in Madhya Pradesh organised a live interactive telecast of a bâlâ presentation in Hindi. Stakeholders from the district, block and cluster level participated. It elicited a good response from teachers and education administrators. Recently, soon after attending a bâlâ workshop some enthusiastic engineers in Orissa improvised and executed some bâlâ design ideas in a few schools.

These presentations can also be made before members of parliament (MPs) or member of state legislative assembly (MLAs) who control substantial funds for local area development work (referred to as MPLAD or MLALAD as the case may be) in their constituencies. They are usually interested in ideas that show visible, tangible results during their tenure. The good news is that bâlâ brings with it several visible changes in the built environment. The sites where

interventions were made in the formative stages of bâlâ in Rajasthan were the most talked about in the local community. So much so that demands to construct schools with bâlâ elements also came in from neighbouring districts. This largely happened due to the 'visual presence' of bâlâ schools. Detailed information, along with models, for select ideas is available with the bâlâ team and can be used for planning and implementation. Training modules for different stakeholders are also being developed.

Stakeholders must have a plan in place

Planning for bâlâ should commence at the grassroots to address the specific requirements of a school. Hence each school – whether government or private – should assess its own specific needs before setteling for a set of bâlâ ideas The real challenge is in large education programmes, where individual schools may still be used to centralised planning. Perhaps it is a matter of time when they start practising the decentralised mode of planning. Ideally, the immediate stakeholders (VECs and PTAs etc.) of the school must sit together and visualise a master plan for the school. That will help ascertain the kind of growth they envisage and the ways to achieve it. For example, with a master plan in front of them, the stakeholders will have a clearer idea about where to construct more rooms (if the school needs them), if and when funds are available to do so. They will be able to tell where the plantation should be done so that it does not obstruct future expansion. To do this, teachers and engineers/architects will have to identify the issues of maintenance, environment enhancement, repair or expansion. It will be good to prioritise these jobs as 'essential' and 'desirable'. Subsequently, the VEC or PTA can discuss the limitations and potential of the school viz. a viz. space, budget, time and other resources. In other words, the above exercise will help formulate a plan at the school level, which clearly identifies the problems of a school and offers the best possible solutions as well. Such a decentralised system of habitat level planning is already envisaged under the SSA in India. The document on SSA *Framework for Implementation* explains this in detail. It may also be noted that bâlâ ideas are not just for formal elementary schools but are equally valid for Alternative and Innovative Education (AIE) or Education Guarantee Scheme (EGS) schools. Hence, this planning exercise may take place across all such schools.

Where such a decentralised method of working is not yet in place, a middle path may be undertaken. Here planning for schools can be done at least, at the cluster or block level so that the local context of needs and potential is still adequately addressed.

Reviewing and consolidating plans at the cluster and block levels

Such plans can be compiled from different schools at the cluster and block levels. Similar or common areas of intervention across the schools can be worked out to plan an organised delivery mechanism for all of them. For example, if several schools need to improve incoming natural light or additional classrooms, an architect from the state or district can visit them all and, then, make a consolidated implementation plan for common problems. Or, if several schools ask for biogas plants, the state-level energy agency (see annexure 3) can be contacted for a particular scheme or technical support. Guidance in prioritisation, allocation of funds or even design can also be provided at the cluster level. If required, the cluster in-charge may visit the school to discuss and make suggestions. Cluster or block level units can undertake a detailed survey and classify the needs of schools wherever such decentralised systems of planning do not exist. A team, comprising an architect, engineer and experienced teacher can – in consultation with the respective PTA/VEC and schoolteachers – identify the areas that need inputs like providing for security grills, boundary walls or good chalkboards etc.

Pooling in funds at the district level

A larger plan can be visualised at the district level based on the needs of the schools, clusters and blocks. Convergence of various funding resources and the role of the district education coordinator and the district administration (who hold the purse strings) is crucial. For example, if some of the schools in a district are all-girls' schools, they can receive funds from the National Programme for Education of Girls at the Elementary Level (NPEGEL) in India. Innovation funds at the district level can be utilised where some schools also have a repair component. The cost of bâlâ elements must be added in the new school design wherever a new building has to come up to determine a new unit cost. The district or state level energy agency can be contacted for ideas relating to energy generation in schools. Tribal districts, often, have access to funds for schools for tribal children. These can also be utilised for executing bâlâ ideas. Prioritisation and phasing suggested by individual schools will help the district office to be fair and judicious in sanctioning plans with 'essential' and 'desirable' features. In the initial phase, a district may choose a few school sites that are visible and close to the road for the purpose of visiting and demonstration. Subsequently, and depending on the demand for such ideas, more schools can be brought under the bâlâ umbrella.

Making systems for coordination and support at the state level

Often, district plans of schools are put together at the state level under the SSA. Different units under the education programme can provide inputs to the planning unit at the state level. For instance, the Integrated Education for the Disabled (IED) unit under the SSA can identify the bâlâ elements that are specifically useful for differently able children and provide allocated funds and other

resources from the state coffers. The teacher's training or pedagogy unit can identify modules on 'How to creatively use school spaces' in its regular training programmes and allocate resources. In the long run, textbooks that are usually designed at the state level can include certain exercises that are designed around the use of bâlâ. The state office must get the state energy agency to help the schools with acquiring and maintaining Solar Lanterns, Solar Cookers and Biogas Plants. Contact information is available in Annexure 3.

Planning in phases: demonstration and scaling-up

Implementation of bâlâ in a state may be conceived in, at least, two phases: the demonstration phase and the scaling-up phase. In the initial phase, the state may choose to introduce the concept of bâlâ in a few districts. A uniform strategy may not work since each state has its own mechanism of delivery. For instance, some states give the charge of construction to PTAs (that have a yearly tenure) while some others opt for VECs (that have a longer tenure). There may still be some states that repair or construct school buildings through the Public Works Department (PWD) and contractors. Introduction of bâlâ ideas in pilot districts may help fine-tune the planning and execution processes before state-wide implementation.

Cost and budgeting

Most of the bâlâ design ideas presented here can be easily classified as 'child and learning friendly'. Therefore, funds can also be obtained from the pedagogy budget head even though the work may happen under 'building construction'. In other words, just as bâlâ is interdisciplinary in concept and design, its funding can also be interdisciplinary in implementation. Funding to properly implement bâlâ can fall in the following categories:

- Orientation and capacity-building
- Design development
- Management and supervision
- Building construction / Construction of TLM
- Research and evaluation

In case of private schools or institutions, the costs under these heads can be met through their own customised systems. Other recognised schools may access funds through:

- Individual donations and contributions
- Municipal funds (urban areas) or Panchayat funds (rural areas)
- Education funds (e.g. funds under the SSA, or those under education departments)
- Other schemes (e.g. those from other government schemes)

Funding the soft components of bâlâ

In case of large government based programmes, these can be met through different designated budget heads. For example, all the resources going into orientation and capacity building of different stakeholders for bâlâ under the SSA can be put under the 'Training' head. This can translate as content generation, training materials production and organising costs. In most cases, an additional module can be added in the ongoing training. A team of master trainers and trainers can be formed for large-scale education programmes to reach a larger number of stakeholders. In many cases this training will be preceded by research of baseline data, resource mapping, etc. to create a context-specific design intervention. Later the same research data will help in evaluating the outcomes as well. Often there is a tendency to undermine the value of good design development and not enough funds are allocated for it. Investment in good quality, properly researched design goes a long way in delivering effective and usable end products. Under the SSA costs towards such qualitative activities can be met under 'Research, Evaluation, Supervision and Monitoring' (RESM) budget head. Similarly, the cost of supervision and technical support can be met under either RESM or the 'Project Management' head by allocating resources for in-house and outsourced inputs. Thus, the cost for hiring additional in-house engineers or architects can be met under this head at the state or district level.

Funding the hard components of bâlâ

The cost of constructing bâlâ elements varies from one school to the other. Schools of a particular size and type design may have certain standard, but essential, bâlâ elements. Indicative costs based on 2005 index in India are given in annexure 1. However, it is best to integrate the cost of these elements in the unit cost of the building in case of new schools. Going by the past figures, the cost of constructing the entire range of bâlâ elements can be an additional 8% to 10% more than the cost of a regular new building. This additional cost can be financed through local area development funds or *panchayat* funds on account of the child friendly approach of bâlâ elements. The same cost can be met through repair and maintenance grants, school improvement grants, funds under special schemes for disaster, famine relief and drought relief etc. for existing buildings. Various ministries and departments in India can support different activities and ideas wherever internal funds are not forthcoming. For example, the Ministry of Non-renewable Energy Sources (MNES) in India subsidises ideas relating to energy through its state counterparts. The Department of Science and Technology supports, through its counterparts in states, ideas pertaining to science activities. This kind of convergence can be very useful if district and state offices can utilise various schemes and forge a formal relationship with the other departments and ministries. A list of possible schemes is given in annexure 2.

Implementing bâlâ

Adding to existing capacity-building efforts

Capacity building of different stakeholders is already being undertaken for various components of educational programmes. Specific modules can be included for better understanding of planning and implementation of bâlâ issues. Some ideas and schemes, for example, can be presented to education administrators at the block or district level during induction or in-service training. Similarly, interactive modules on 'How to creatively use available built space' and 'How to use building as learning aid' can be included in the pre and in-service training curriculum for training teachers in the District Institute of Educational Training (DIETs) and other teacher-training institutions. The State Council for Educational Research and Training (SCERT) and State Institute for Educational Management and Training (SIEMAT), the state level apex institutions for academic and planning and administrative issues can initiate the process. Active involvement and ownership of ideas by the teachers is essential for its development and effective use. For example, issues related to hygienic defecation and proper use of toilets or those related to energy and environment can be part of the training modules. The Rajya Shiksha Mission in the state of Madhya Pradesh is already planning to include a training module of this kind for its teachers, cluster resource coordinators and technical resource groups. In Karanataka state, a similar exercise for technical personnel is also planned already.

Design workshops at the state or district level should be held where consulting architects or engineers can be trained to include bâlâ ideas for new and existing schools at the planning stage. In decentralised systems, VECs and PTAs have the powers to demand provisions for their schools. But their understanding about the school and the education system is limited. They can be exposed to various possibilities and ideas during their yearly training through visuals, models and films.

Masons, carpenters, metal fabricators and painters should be equally involved in the process. While most ideas utilise simple tools and materials, they require skill and precision during execution. Such skills may need to be developed. For example, a few masons in a cluster can be identified and trained on the job for making good chalkboards and all the VECs/PTAs in the area should be given their contact addresses. Fabricators (for making and fixing a safe Tyre Flipper or Writing Grills) and painters (for neatly painting visuals or numerals with precision on walls, doors and windows etc.) can also be trained in a similar way. This method of developing local level resource was also used under the Lok Jumbish Education programme in Rajasthan. A local resource

base created in this way will go a long way in scaling up and maintaining the learning aids. Existing district-level technical training institutions like the polytechnics or Industrial Training Institutes (ITIs) can be gainfully utilised for such trainings and supervisory work.

Detailed information is provided in annexure 2 for utilising various government schemes to execute bâlâ designs and for capacity building in schools.

Designing for bâlâ with complete understanding

The suggestions being made here are generic and can help make good school buildings even if bâlâ ideas are not incorporated. Comprehensive design material for about 150 design ideas has already been developed by the bâlâ team and can be adapted for use in different regions. However, it may be noted here that it is not just the knowledge of a bâlâ design idea that is important. Equally important is to have an understanding of where and how to locate or group them with other ideas for overall effective use. While this book does inform about its importance, the bâlâ team has comprehensively worked out such details for each design idea in different situations. Research based support is available from the bâlâ team (see annexure 3 for details). The ideas presented here need comprehensive understanding of design issues before they are integrated in any school building.

Generic designs to address diversity

Most states in India have several intra-geo climatic regions. It makes sense to institute design capability at the regional level, if not the district level. If an in-house design cell is not possible at the district or state level, a District Resource Group (DRG) or State Resource Group (SRG) of local architects and engineers can be formed to give inputs as and when there is need. Focussed orientation and training on bâlâ can be provided to such resource groups, project architects and engineers as well as artisans. Design tools can be developed to help project architects and engineers in taking on-the-spot decisions. Building models that can be assembled and disassembled and taken to sites, can be used for communicating certain concepts to the VECs because technical drawings may not work for them. Local artisans and PTA/VEC members must be encouraged to participate in identifying design solutions for quick decisions and creating a sense of larger ownership. Centralised design solutions should be avoided. If that is not possible, generic design solutions like those suggested in this book can be developed with scope for local improvisation. Within those suggested, some are more generic than others and can be thought of as 'essential' in any school. Thus, if a wider choice is not possible to implement immediately, at least these more generic ones can be prioritized:

Classroom space
- Grid Boards
- Dot Boards
- Display Surfaces
- Corners for Books

Space for communication
- Peer group activity pockets for different group sizes
- Counter Space with Amphitheatre for Interaction

Nature and play
- Space for Outdoor Natural Environment
- Space for Outdoor Play

Tools for on-site improvisation

Listed below are some documents, which can be useful tools for designers in improvising according to the local needs:

- A ready-reckoner of anthropometric data (dimensions of building elements – chalkboard, door, window, furniture etc. for comfortable reach and use by children of different ages and sexes)
- Climatic data, comprising average rainfall, wind humidity and temperature, data on local plant and trees (with attributes of significance to schools) and its application in school design
- A design guide for different capacities of biogas plants
- A design manual for designing and constructing for differently able children
- Resource mapping data of locally available building materials and techniques. An inventory of solutions devised by different people over a period of time for better natural lighting, orientation, plantation, constructional detail etc. in the form of sketches or photographs.

Designer as catalyst of ideas

Ideally, for a large education programme the role of the designer can be of a catalytic agent who initiates and helps teachers and the community to participate in the process of developing the environment of the school. While the teachers can contribute to the 'content' of bâlâ ideas, the community can acquire the necessary building materials and skills, and the education department can facilitate the whole process.

Tools for technical support in construction of bâlâ ideas

Some bâlâ ideas may need a full 1:1 scale template for consistency while painting alphabets, numbers, special visuals, dots and grids on boards etc. This is useful for ideas related to measurement and angles etc. Simple shaping tools using metal flats can be made for engraving patterns on the walls or dots on Dot Boards. A reusable kit of such simple aids and tools can be created at the cluster level so that it can become a resource for use by a group of schools. Some ideas like Tangram Tiles require an assortment of leftover tiles. If many schools can ascertain their requirement and place bulk orders at the district or state level, the tiles can be bought from local dealers at a heavy discount. Similarly, the community should jointly obtain discarded tyres from local vehicle owners for making Tyre Flippers. The local horticulture or forest department can chip in to provide and plant selected tree species in various schools. Supervision during construction Demonstration sites may require close supervision to begin with so that good artisans can be identified and given focussed training for future scaling up. If a typical school site requires engineers or architects to go there once every week during normal construction, they may need to go twice during the execution of bâlâ ideas, especially in the finishing stages. In many cases, the presence of a teacher at the site is important for supervising lettering, spellings, consistency of textual style, selection and painting of visual guides for Activity Boards etc.

Creating a technical resource

Most good artisans are able to pick up specialised skills after they have worked on two or three small sites. If properly distributed across a cluster, they can be technical resource people for new construction and its subsequent maintenance. This may also ease the tremendous pressure on architects and engineers in the scaling-up phase. Schools should have a comprehensive database of human and material resources at the cluster and block level for future use.

Reviewing the outcomes of the demonstration phase

In case of large-scale education programmes it will be useful to take stock of specific situation and learn from the experiences from the demonstration phase of bālā intervention. It will help in fine-tuning various aspects of planning and delivery mechanism as well as designing before scaling-up. Ideally pre and post intervention evaluative studies will help in determining the impact and value of this intervention in a particular context.

Putting it all together

Log-frame for planning and delivery

School level	Narrative summary	Verifiable indicators	Means of verification	Assumptions
Goal	• Better learning environment	• Higher learning outcomes	• Baseline and post-intervention studies	
Purpose	• Learning with fun • Higher attendance and retention, better learning outcomes	• Children's affinity to their school • Actual attendance and retention figures	• Baseline and post-intervention studies	• The vision of education is shared by all stakeholders
Output	• Better utilisation of available space and resources	• Visible change in the physical and cognitive environment of the school	• Visit to schools and classrooms	• Different units in the programme work in coordination • Administrative flexibility
Input	• Design ideas • Capacity-building • Master plan preparation • Formulation of implementation strategy • Convergence of available funds and resources • Monitoring • Supervision	• Orientation of stakeholders and dissemination of materials • Training and workshops • Master plan with prioritisation and phasing • Quality of supervision	• Visit to schools, inspection of records and data, interviews	• Planning at the school level • Continuity of personnel • Timely preparation of plans • Availability of funds and technical resources • Adequate inter-unit coordination

executive summary

This section contains a executive summary of the book.

This book is for all those who support the idea of making the physical environment of an elementary school more resourceful and child friendly for learning. At the outset, it elaborates on the interdisciplinary process of evolution and development of ideas and, then, describes with examples those ideas that directly relate to the process. Subsequently, it illustrates synthesising diverse design ideas in school spaces. Finally, the book deals with the issues of planning and implementation of bālā ideas.

Evolution and development of design ideas for school

The process of evolution and development of design ideas keeps the child in focus. The ideas develop from observation and understanding of:

- Natural child behaviour in school spaces.
- Children's aspirations from school spaces.
- Domains of child development - physical, social, emotional, intellectual - and if they are being adequately addressed in school spaces.
- Issues of inclusive education for differently able children.
- Problematic concepts for children and teachers across subjects, like mathematics, science and language etc.
- Specific needs of children due to diverse socio-cultural-educational backgrounds.
- Typical building design, and upgradation, repair, construction and environment enhancement issues in new or existing buildings.

While an idea may originally stem from any one or more of the above observations, it addresses more than one kind of problem. Hence, if children want to have a thermally comfortable environment, the idea to plant winter deciduous trees in a tropical area (to minimise direct heating of buildings) will include species that also produce a range of learning materials.

Bâlâ intervention takes place at two levels. Firstly, built elements like floors, walls, windows, doors, steps, ceilings, fans, furniture and trees are designed to also function as learning aids. Secondly, these elements are located in interior and exterior spaces like classrooms, corridors, and the backyard, so that a variety of self-learning situations are generated across the school space. This also helps in dealing with multi-grade situations.

Design ideas for built elements

The book proposes the following representative design ideas for various built elements:

Understanding children and their needs

Ideas to address children's aspirations from school spaces

1. Shading the Roof to reduce heat* (related to the desire of thermal comfort)
2. Tyre Flipper (related to the aspiration to have play equipment)
3. Fan Colour Wheel (related to the aspiration to have colours around)

Ideas related to natural child behaviour in school spaces

1. Mystery Wall (related to peeping behaviour)
2. Cyclic Concepts of Time (related to revolving around a pole)
3. Estimating Weight (related to the habit of moving furniture)

Ideas to address the domains of child development

1. Growing Trees for Climbing and Jumping (addressing physical development)
2. Placing Storage Material, Learning Aids and Activity Boards etc. in a way that is accessible to children (addressing physical development)
3. Spaces to be in Groups and to be Alone* (addressing social-emotional development)
4. Alphabet Boards for Stimulation (addressing intellectual development)

Learning environment to include differently able children

1. Ramps, Rails and well-laid out Graphics
2. Grab Bar as Pipe Phone
3. Engraved Motifs in Plaster as a Pre-writing Aid (tactile learning material on walls)

Learning resource for subjects through school spaces

Mathematics

1. Measurement on a Wall (estimating lengths, distances around us)
2. Door Angle Protractor (identifying angles around us)
3. Fraction Aids on a Grill, Fraction on Wall and Floor Tiles (understanding fractions in different ways)
4. Tangram Tiles (playing with geometrical shapes and their properties)

Sciences

Understanding the notion of time

1. Sundial in an Open Space (understanding the movement of the sun across a day, month, year)
2. Planetary Orbits on the Ground (understanding their movement around the sun, seasons and time periods)
3. Classroom Calendar with Clock (understanding the concept of week, month and year)

Understanding and reading maps (based on the fact that the complexity of an idea increases as the child grows)

1. Map of Class on the Teacher's Table or Classroom Floor (for grades 1-2)
2. Map of School on a Centrally-located Courtyard/Platform (for grades 3-4)
3. Activity Brick Map of State or Country (to make your own river, mountains etc. – for all grades)

Language

1. Writing Aid on Window Security Grills (to practice gross motor movement for writing)
2. Word Wall (to understand and make sentence structures etc.)
3. Trails to Explore (letters clues camouflaged in the built elements for exploration)

Creative expression

1. Children's Wall* (wall surface for a child to write, draw and freely express her/his thoughts)
2. Dot Boards on Floors and Walls* (for creative exploration of forms and shapes)
3. Grid Boards* (for creative drawing)

Inculcating values and habits

Learning to conserve water

1. Rainwater Harvesting (water re-charger pits and trenches to increase ground water level)
2. Waste Water Herbal Garden (to grow plants of medicinal value with minimal water)

Learning from the natural environment

1. Growing a Variety of Plants in School (to have regular supply of learning materials)
2. Making Toys from Leafs (plant materials for learning)
3. Habitat for Birds (to observe closely and learn about their habitat in school)

Learning to conserve environment and energy

1. Biogas Plant (for cooking meals using animal and human waste)
2. Solar Cooker for cooking meals (pre-cooking or cooking of meals on sunny days)
3. Energy-efficient Stove (for cooking meals using wood)
4. Solar Lantern (converting solar energy to electrical energy for lighting night schools)

Ideas for sheer fun

1. Board Games on Floors (indigenous games using pods and seeds etc.)
2. Mirrors on Walls (to see oneself in concave or convex mirrors and have fun)
3. Jaali Wall (Play of Sunlight through designed fenestrations)

Responding to socio-cultural and educational background of children

1. Tracing and Rubbing Surfaces (in-house duplicating tool where maps, other stationery cannot be bought)
2. Counter Window (for simulating life-skill situations through role play, especially where girls are not allowed to venture outside the neighbourhood)

It is possible to execute these ideas as stand-alone interventions, but they prove to be far more cost-effective if integrated while repairing or enhancing the environment in existing buildings or new constructions. Many of the above-mentioned ideas can be integrated while repairing or making a floor, wall, door or window etc.

Innovative repair and environment enhancement for learning

Simple innovations are possible to increase the usability of classrooms, corridors or backyard spaces.

1. Renovating a dilapidated corridor with bâlâ ideas for use by children
2. Splaying windows and jambs and painting internal and external surfaces (for better internal illumination and ventilation)
3. Modifying backyard space for learning activities
4. Creating a learning space between two isolated blocks

Grouping design ideas in school spaces

The above-mentioned design ideas can be put together in a variety of built spaces:

Indoor and Enclosed Spaces

1. **Classroom Space** : Many of the above-mentioned ideas may be grade-specific. Each grade may choose the ones suitable for it. Within a classroom, each wall can be developed so that the space is subdivided into different learning activity corners.

2. **Circulation Corridor Space** (common space for all grades) : It can have a variety of activity ideas that allow children of different age groups to mingle, learn and have fun. These include Board Games on Floors, Fraction Tiles on Walls and Floors, Colour Seriation Tiles, Activity Boards on walls and cyclic natural phenomenon (like phases of the moon) around columns to understand the concept of time.

3. **Space for Exploration and Discovery** : Corridors can also be used for exploration and discovery. These can have perspective lines, Tangram Tiles, Wall Periscope, Jaali Wall, tools to estimate distance etc. apart from various working and display surfaces in the space for children to explore.

4. **Kitchen Space for Energy Generation and Conservation** : The kitchen space can have renewable energy-based or low energy-based systems to cook meals efficiently. It is important for the children to be involved in the process of energy generation and cooking so that they understand the value of energy and optimise consumption.

Incidental Spaces in Semi-open and Outdoor Areas

1. **Counter Space with Amphitheatre for Interaction*** : This is a special space that enables children to simulate life-skill situations. For example, a ticket counter or a shop within the protected school environment. Children can learn mathematics and how to behave in a queue etc. through role-play. The amphitheatre would allow activities of creative expression in the same space.

2. **Space to Play with Mud and Sand** : This space will have an Outline Brick Map of a Country or State for children to explore their geography lessons while playing with mud and sand.

3. **Space for Outdoor Natural Environment*** : This space can have various elements, like learning materials, Waste Water Herbal Garden, trees that allow children to climb and jump etc, and plants/trees that invite insects, bees and birds for the purposes of feeding and habitat for children to learn more about the natural world around them.

4. **Space for Outdoor Play*** : This space will have play equipments made from discarded tyres to act as tunnels, bridges, climbers, swings etc. The space gently infuses the value of utilising waste material.

Planning and implementing bâlâ

Bâlâ ideas are not just for formal school but also for Alternative and Innovative Education (AIE) and Education Guarantee Scheme (EGS) schools. To take innovative ideas to schools, inputs need to be planned in a coordinated manner. Implementation of bâlâ in schools will require simultaneous inputs in:

1. Onenting and exposing the stakeholders – administrators at the state, district, block and cluster level, teachers, VECs, PTAs and engineers – to bâlâ ideas.

2. Capacity development of teachers, engineers, designers and artisans to sensitively plan and implement the ideas.

3. Planning the school environment for specific needs, while keeping the potential and limitations of the school in mind. A school may define its essential and desirable needs. Interdisciplinary inputs are required for planning at the state, district, block, cluster and school level. Convergence of schemes and resources already available must be sought. The intervention may be planned in two phases – the initial demonstration phase and the, subsequent, scaling-up phase after delivery systems have been refined.

4. Sensitive design, quality construction and effective supervision are key to successfully implement the ideas in schools. Investment in good quality design development is essential and it goes a long way in delivering an effective end-product.

5. All (*) marked ideas are more generic than the rest and could be taken as essential for a school.

6. The various costs of bâlâ intervention can be included under the heads of training, management and construction. The cost of construction may be met through convergence of resources within the project or by utilising resources and schemes on science, environment and energy etc. available under different ministries and departments of the government.

   To achieve the above, innovation within the existing delivery mechanism may also be needed.

The annexures contain valuable information to take the ideas forward.

7 conclusion and the way forward

This section has broad conclusions and the way forward for bâlâ.

Conclusion

As we said earlier, a school isn't about edifices and physical spaces alone. It is about a learning environment that needs to be conceived in a holistic manner and delivered in a way that is best suited for its users. The physical environment is an intrinsic part of this process. Since buildings are the most expensive physical assets of a school, effort should be made to derive **maximum educational value from them.**

Bâlâ allows the **built structure** of the school to have a dual use:
1. To give 'shelter' to educational activities
2. To be a resource for teaching and learning

Design ideas under bâlâ can be integrated into both new as well as existing built environments through simple improvisations. A range of about 150 design ideas, with comprehensive details across spaces and subject areas, is available with the bâlâ team.

The intervention takes place at two levels:
1. Designing **built elements** like floor, wall, ceiling, door, window, furniture and playground as **learning aids.**
2. Developing indoor and outdoor **spaces** to create **self-learning situations.**

Bâlâ enables children to have **real and concrete experiences** of measurement, angles, time and mapping etc. It can make the environment sensitive to their physical, emotional, intellectual and social needs for better learning. Bâlâ does **not** attempt to illustrate **a model school.** It appreciates the diversity of cultures, geo-climatic conditions and needs and addresses them differently in different schools. It helps teachers in dealing with multi-grade situations and integrates differently able children in a 'normal' school.

Bâlâ is an **interdisciplinary model.** It requires different stakeholders involved in school development – teachers, PTAs, VECs, engineers, architects and administrators – to think and work together while keeping the child in focus.

These stakeholders must be oriented to bâlâ for them to be able to execute its ideas. Their capacities to **think out of the box** must be enhanced so that new possibilities can be explored. Thus, civil work professionals must be oriented to sensitive development of spaces in accordance with pedagogy. School administrators and teachers must be trained for effective use of available built spaces and elements. Education administrators must be persuaded against imposing the same ideas and designs on different schools.

Decentralised planning is must so that every school can develop its vision and plan in phases to address its goals. Each school can prepare a **master plan** based on its needs, potential and limitations. Cluster and block level officials can review and consolidate these plans and interlink them for better utilisation of resources. The district unit can address the various needs of schools through pooling in the available resources. The state unit can help coordinate and provide technical, administrative and pedagogic support – in-house or outsourced. Adequate human and material resources need to be in place for decentralised design, construction and supervision. Artisans can be trained on the job and identified to be resource persons for future work. A cluster level resource pool of artisans can be created for construction and maintenance of schools with bâlâ designs.

All the **stakeholders** must work as a **team** for implementing these ideas. Administrators must facilitate planning, architects must catalyse the design process, teachers must develop or refine content and curriculum, PTAs/ VECs must manage materials and skills and engineers must supervise.

The way forward

The way forward is to, quite simply, get going.

Just look around in your school and see how well you can use the spaces and its elements for learning, if you are a teacher. You may like to do a 'mock exercise' by simply pasting a chart with dots in place of a board and see if children would like to use it.

Ask yourself, if you are a VEC or PTA member, if you would like your children to study in such a school? Would you like to build one, if such a school does not exist nearby? Why not discuss the possibilities with the teachers and other members of the community? Identify the ideas that do not require outside support. Just prepare a plan, go ahead and execute them. Make a proposal of the ideas that need external support and send it to the Cluster or Block Resource Centre (CRC/BRC) for discussion in the next planning exercise.

If you are at the cluster or block resource centre, share these ideas with the schools in your area and work on a coordinated plan. In the fortnightly/monthly meeting at the district, you can even share the response of the schools and work on a definite plan.

At the district level, share these ideas with the schools in your area and with colleagues and subordinates in other units. Check if the funds and resources in your district can be utilised for this intervention. If yes, plan in a coordinated way and appraise the authorities for the required sanctions. Inform the state level about this. Ask them if they can support you in any way – technical, administrative and/or financial?

If you are at the state level, you may like to share these ideas with all the administrative units and, then, plan to implement these ideas with them. You can also explore the support of other department and ministries to direct funds under some of their schemes to your schools.

Information given in the annexures will help you to move forward.